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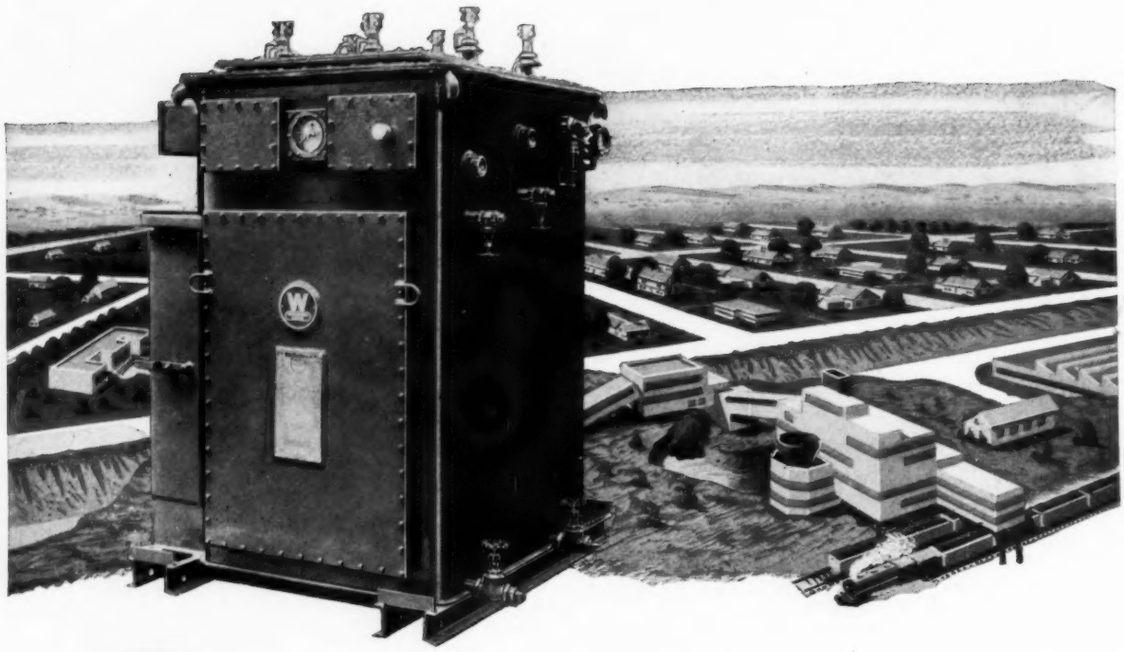

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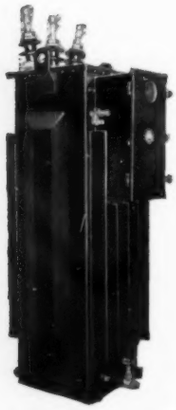

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Front Cover—Tank Gauger Descends to Bottom of Tank, Plantation Pipeline Co. (Photo Courtesy of Standard Oil Co. (N. J.)

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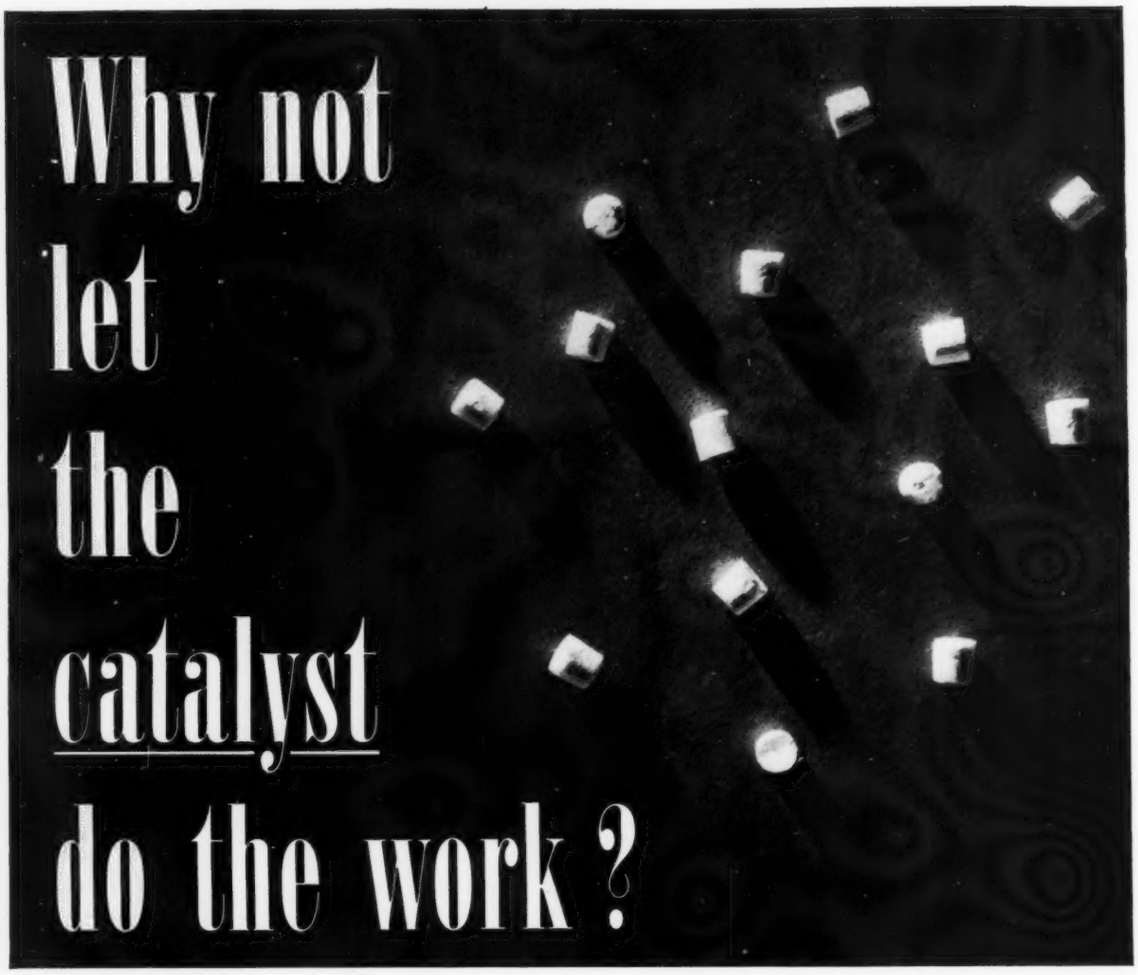

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EDITORIAL

SHAPING A SOUND INTERNATIONAL OIL POLICY

ONE of the good results of the discussion that has gone on over the past two years regarding a foreign oil policy for the United States has been its influence in informing officials of the government on the international oil situation and the conditions affecting world trade in petroleum products. Experiences during the war, together with the report prepared more than a year ago by the oil policy committee of the Petroleum Industry War Council and the voluminous evidence presented by representatives of the industry before the O'Mahoney committee provide a fund of information that should be a valuable guide to the Department of State and other government agencies having to do with international oil affairs.

That such information is needed in official quarters is amply evident to anyone who has followed the course of events over the past dozen or more years during which the attitude of the federal government toward American interests in oil developments beyond the country's borders has ranged from indifference to hardly concealed hostility to those who were attempting to maintain or extend the nation's stake in this industry which has so convincingly demonstrated its vital significance during the past five years.

The fact that Congress itself is taking an active interest in this subject is a highly encouraging indication. In the past its members, with a few notable exceptions among the representatives of oil producing states, have been inclined to view international oil affairs with indifference and to accept the lead furnished by the executive branch of the government in connection with them.

In the decade following World War I the United States formulated a definite and vigorous policy in relation to American participation in oil development in the international field. Under the leadership of Secretary of State Hughes its position was defined and asserted in the exchanges which took place in connection with the formation of the Iraq Petroleum Company, a commercial enterprise in which the nationals of several countries took part under the protection and guidance of their respective governments. An agreement between the representatives of France and Great Britain covering their participation in the undertaking was so drawn as to exclude Americans from any share in its development. The State Department of the United States promptly took exception to these terms. In the discussions that followed Secretary Hughes firmly upheld the right of Americans to equality of treatment with other nationals and as a result of the arguments which he ably and forcefully presented five American companies were allowed to participate in the Iraq Company with the same share in its ownership as that of the British, French and Dutch holders.

In contending for the right of Americans to representation in this typically international operation, the Secretary of State was moved by no special concern for the oil industry but was simply upholding the principle of the open door which was the guiding principle of American commercial policy at that time. It asked for no exclusive privileges but did insist upon equality for all in access to markets and in opportunities for the exercise of commercial enterprice.

During the maintenance of this position there was a great expansion of American activity in oil development outside the United States. Concessions in the Middle East that have since proved their tremendous value were obtained and brought into production. American companies sank millions of dollars in exploration in Latin America but out of the venture developed the great Venezuelan industry and lesser production in other areas. The substantial position which America now holds in the world's reserves to which the State Department now points with satisfaction was largely established during this period. The following decade was marked by discriminatory action, unjust taxation and even confiscation of American owned properties on the part of various nations without effective resistance or more than feeble protests from Washington but American companies continued to maintain their position and to expand their trade wherever possible in spite of the absence of support by their own government.

The nation now is definitely on the road to a more intelligent and progressive policy in dealing with the international oil situation. The State Department has recognized the importance of oil by setting up a division specifically to deal with it. It has declared its purpose to protect the legitimate interests of its oil producers at home and abroad. Army and Navy officials are outspoken in their demand for the development by American companies of outside sources of oil supply to meet possible future military needs. The public has become oil conscious to a greater degree than ever before and the record of the oil industry in the war commands respectful consideration for the views of its representatives. All these factors should operate to bring about the establishment of an oil policy that will preserve the opportunities that American oil operators have created through their own energy and initiative.

MOBILE BASES SECRET OF STRIKING POWER IN PACIFIC

By William J. Maddox
Chief of WORLD PETROLEUM'S Washington Bureau

Fueling and Supply Service Moves with the Fleet Right into Combat Areas and Keeps Planes and Ships in Operation Without Interruptions to Reequip—Under System Now Developed a Combined Naval and Air Force Can Go Anywhere Taking Its Base Along.

Top Left: Lines Secure Ship to Fuel Carrier.

Top Right: Huge Waves Foam Over Bow of Destroyer During Refueling Operation.

Above Left: Platform Serves as Terminal for Submarine Pipeline.

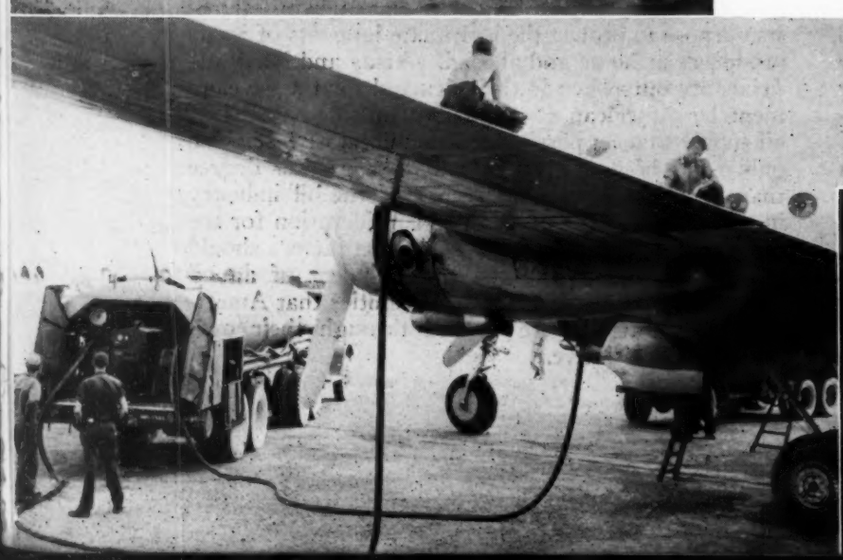
Left: Fueling Depot in the Southwest Pacific.

Bottom Left: Mobile Filling Station Servicing Plane.

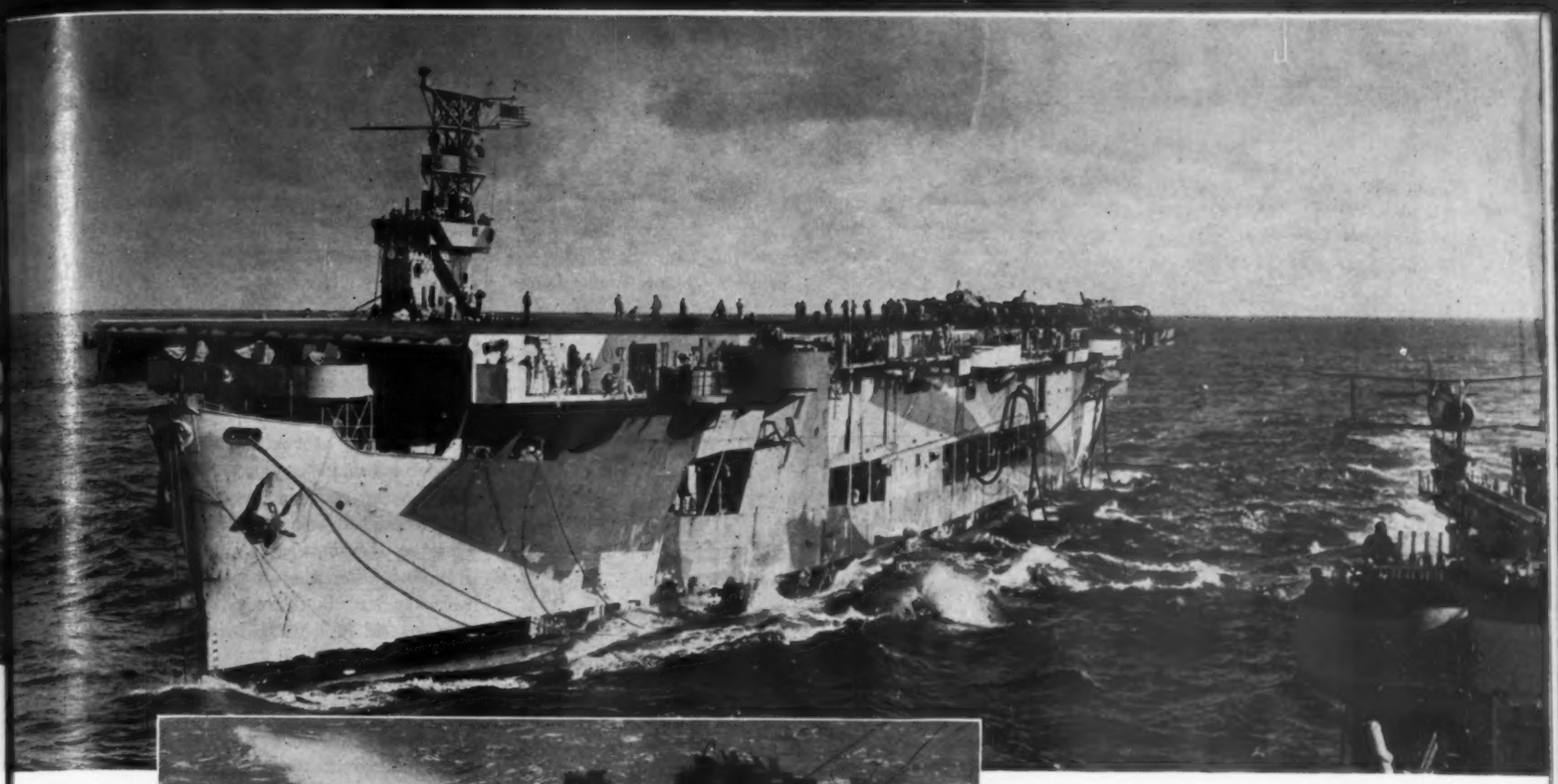
"FUELING at sea" still is one of the Navy's top-flight secret operations. Until a few months ago mere mention of it was all but "off the record," and when I left Washington for a 22,000-mile tour of advanced Navy bases in the Pacific to see at first hand something of how war in that theater is being oiled, there was considerable doubt as to how much I'd be allowed to write. Navy promised to turn the cards face up on the table but wouldn't guarantee how much the censors would pass, if anything.

So it was a pleasant surprise to find that some of the outer wraps at least could be pried loose from Service Squadron 10, our floating supply and repair base that backs up the fleet and that Fleet Admiral Chester W. Nimitz had called our "secret weapon." Fueling at sea is one of the many activities of the squadron, or as it is commonly termed out there Comservron 10.

Servron 10 is Navy's answer to the challenge of distance. It's commonly remarked out there that we are now really fighting two wars in the Pacific —one against the Japs, and the other against the thousands of ocean miles that supplies for our



Below: Man Carried Overside During Fueling Clings to Cable to Save Himself.



Above: Lines Lowered—Hose Released—Fueling Operation Completed.

Right: Waves of White Foam Splash Over Vessel During Oil Transfusion.

Ship-to-Shore Pipelines Fuel Oil Tankers.

armed forces have to be transported over. And as the fighting front moves farther westward toward the Jap homeland the task of keeping an increasing amount of supplies flowing smoothly forward becomes more difficult.

Nimitz's mobile supply and repair base has literally revolutionized military operations over vast ocean areas far from land bases. It has extended the striking power of the Navy thousand of miles and made it possible not only to strike but to follow up the attack. Without this floating base, the Okinawa operation, bigger than anything the Navy previously had attempted, would probably have had to wait a long time, possibly years, till adequate shore bases could be established. It may be that more than any other single development of the war, this "secret weapon" has prevented the Japs from digging in so firmly that it would have taken years to dislodge them.

Squadron 10 operates under the Service Force, Pacific Fleet. From this main base a network of subsidiary mobile bases operate at the furthest anchorages. Thus it serves as the last jumping off place for fighting ships of the Fleet before making their thrusts into Japanese waters. Although exact information as to the number of ships and men under the control of Squadron 10 is a military secret, it can be said that ships run into the hundreds and the men into the thousands.

From Their Floating Office Aboard a Tanker in the Western Pacific, These Men of Service Squadron 10 Back up the Fleet with Fuel and Lubricating Oils. Kneeling Left to Right: Lt. (jg) Thomas J. Nagle; Lt. (jg) Clarence Wyatt; Lt. Frans E. A. Widen; Chief Warrant Officer Byrd W. Coolidge; Lt. James W. Duncan. Middle Row: Lt. Lawrence V. Maher; Chief Pay Clerk Thomas Q. Gordon; Lt. Comdr. Carl T. Munson; Lt. Griswold S. Hayward. Rear Row: Pay Clerk W. E. Click; Lt. Newell C. Loomis; Ensign John C. Kehrli; Lt. Albert Pierce, Jr. and Comdr. John W. Howe.

Commodore Worrall R. Carter, U.S.N., of Norfolk, Va., commander of the world's largest floating supply and repair base, explains that the idea of the mobile base is not new. "It was first conceived back in the early 1920's," he says, "when the Navy was experimenting with the so-called 'Base Force,' which was designed to supply the fleet when on the move. The experiments were never carried beyond the preliminary stages.

"Soon after this war started, we realized the Japanese were not going to fight at any one point. Likewise, we realized that we could not operate well from the fixed bases. To do so would have meant building up one big land base after the other, a slow process even when the land was available, and then abandoning them as we advanced closer and closer to the Japanese mainland. Also, there were too few harbors in the Pacific that lent themselves to the construction of big bases.

"There was only one answer: to put the services afloat. This was done. And as a result, the United States Navy today can go anywhere in the world, and takes its supply base right along with it. The striking power of the American fleet is unlimited. We are now in a position to seek out the Japanese Navy wherever it elects to hide.

"From here on out, American warships can operate increasingly closer to the Japanese mainland. Strike after strike can be made. No longer do the fighting ships have to drop back thousands of miles to a port in order to make ready for the next thrust. The necessary ammunition, fuel, supply, and repair facilities, constantly will be within ready range. This means a material shortening of the length of the war."

By June 1944 this product of Yankee ingenuity had gained practice in servicing task force carriers and escort warships for such raids as Truk and Palau. It was ready for its first big invasions —Saipan, Tinian and Guam. "We never had had amphibious forces with us before," says the Commodore. "The floating base always had been concerned with servicing fighting ships of the task force. Now, suddenly it had the great extra burden of hundreds of troop ships and auxiliary vessels of all kinds.

"This was something we had not planned on, but things went off well considering." There were moments during the Marianas campaign, he says, when we wondered how it was going to turn out. But we found a way to do it so the operation would not be curtailed. One bad moment was when the arrival of oil was badly timed and nearly got there too late."

Since then, however, the squadron has grown both in experience and size. How much was demonstrated by its ability to ready the more than 1,000 ships of all types that jumped off for the Okinawa operation. Exact amounts of the various kinds of petroleum products supplied the ships from anchorage for the initial attack cannot be disclosed but the total fuel consumed in the Okinawa operation ran some fifty per cent more than in any other single previous undertaking by the Navy. Just to get the Fleet and amphibious ships to their objective required more than 60,000,000 gallons of fuel oil.

Here are a few comparisons that will give some idea of the astronomical amounts of fuel taken aboard by the fighting ships for the operation: Enough fuel oil to make a train of tank cars 238 miles long, with enough left over to heat 10,000 homes for a year; enough gasoline to run 30,700 American automobiles for a full year—enough to run one car for 300,000,000 miles; and enough lubricating oil to allow for a complete change of oil in 466,000 automobiles.

Some further indication of the size of the oil business carried on by Squadron 10 can be gained from the figures for one month's operations. During March this year, it dispensed some 5,000,000 barrels of fuel oils, 700,000 barrels of diesel fuel, 39,000,000 gallons of aviation gasoline, and 7,000,000 gallons of motor fuel. All that I had heard and seen of the operations of Squadron 10 was an inadequate build-up to the visit I was allowed to make aboard one of the big speedy fleet oilers—the last word in tankers. She was—and is—one of those phantom-like ships that load up from merchant tankers at some comparatively safe anchorage and slip up to the zone of combat to rendezvous with ships of the Fleet. At the time I went aboard there was a merchant tanker alongside discharging its cargo, the last to be taken on before heading up to the vicinity of the Fifth Fleet operating off Okinawa.

Commissioned about five years ago, she was built for industry use but taken over by the Navy. Her speed and capacity are "restricted" but it can be said that she can fuel at sea with her engines doing what was pretty nearly tops with the 80,000 barrel company tankers before the war. At one time she was as heavily armed as one of the old World War destroyers.

"Oiler S"—let's call her—has been through the thick of it in the Pacific. She was in every major engagement except Pearl Harbor and Iwo Jima, and she was one of the two oilers that made the Doolittle hop in April 1942. In one of her operations with the Fleet she had two Jap cruisers and a battleship on her tail all one Sunday but managed to elude them. Since Pearl Harbor up to April 1 this year "Oiler S" has steamed exactly 196,982 engine miles.

Fueling at sea, according to Lieut. Comdr. Hans Christian von Weien, the skipper, is rough, tough work, with never a dull moment. One has no choice of weather, hour of night or day, or nearness of the enemy. Ships have to be fueled when and where they need it. Sometimes the operation has to be carried on on the fringe of a typhoon or at night in almost the very presence of the enemy, in all but a total blackout. And the men must keep constantly on the alert to prevent the hose lines from one ship to the other from fouling. It takes delicate maneuvering to keep the ships from colliding or pulling apart and breaking the hose.

Commander von Weien told me he had serviced as many as twelve ships in a single day. It's not unusual, he said, to have two large carriers, one on each side, at one time; then probably a cruiser and a destroyer. And all this while on the move at a pretty good pace, and if need be executing turns. It takes about six merchant tankers to keep "Oiler S" operating. She gets rid of a cargo in about two weeks.

As to any doubt about dull moments on a fleet oiler even back of the front lines, it happened that while I was talking with him in his cabin one night a radioman came in and handed him a slip of paper. The commander called an officer and told him to black out the ship and call general quarters.

"We've just had a red alert," he explained to me. "Some suicide boys are on the way." Then with a spark of humor in his eye: "But I guess here is about as good as place to be as any on the ship. Below us is about 30,000 barrels of aviation gasoline. Forward we have our tanks nearly full of diesel oil, with a deck cargo of ammunition. And aft we have a cargo of fuel oil, not to mention that merchant tanker alongside. Yes, I guess this is about as good a place to be as any. If we or the merchant tanker are hit anywhere, we won't know what happened."

However, we went up to the bridge. I stumbled and groped my way after him in the blackness. We watched and listened for about an hour, when a report came in that the suiciders apparently had turned off in another direction, and we heard no more of them.

Nerve-center of the fueling activities of Squadron 10 is a "shack" atop a "station oiler," one of a number of old tankers that have been relegated to the duty of serving as floating tank farms. Together with some three score merchant tankers that ply between the West Coast and the advanced supply bases, these tank farms serve as sources of oil for the fleet oilers. The "shack" is the operations office, although overall responsibility rests with the Squadron Fuel Officer stationed aboard Commodore Carter's flagship.

Until recently this post was held by Lieut. Commander Carl T. Munson, who, exhausted from overwork and in a Navy hospital, has been relieved temporarily by Commander Casper T. Frederickson, the Squadron logistics officer. Munson is an old industry man, formerly with Shell for some fifteen years in sales and opera-

tions at Los Angeles, California. It was Munson who directed in a large measure the fueling of the fleet during most of its operations in the Western Pacific up to the time of his illness.

This staff of operations men, headquartered in the "shack" atop the station oiler, is composed almost to a man of oil men of long experience back in the States. Each has his own special line of work in keeping the fueling activities of Squadron 10 running smoothly. In charge of the handling of all bulk fuels is Lieut. N. C. Loomis of Socony-Vacuum, for twelve years manager of its bulk river terminal at Poughkeepsie, New York. He signed up in 1943 and has been out in the Pacific since October 1944. From November through March this year he was harbor fueling officer at Saipan.

Also from Socony-Vacuum comes Lieut. James W. Duncan whose home is on Long Island. He was district manager for the company in New York. In Squadron 10 he has charge of all lube oils, including the estimating of requirements for the Fleet. Many times, he says, his estimates prove to be little more than guesses—a ship may suddenly come down on him for 200 drums when he had them listed for fifteen. Lieut. Duncan also has to keep an eye on fuel oil hose replacements.

One of the duties of the floating office is to keep informed of all cargoes carried by the merchant tankers as they arrive from the West Coast and also to look after the needs of all merchant ships. The duty of boarding these vessels and gathering the information falls to Lieuts. Lawrence V. Maher and Albert Pierce, Jr. Maher hails from Clifton, N. J., and before entering the service had eighteen years service with Gulf in New York. Pierce is from Coral Gables, Florida, and at the time of joining up with the Navy was with Sears Roebuck at Nashville, Tenn. They are boarding and liaison officers.

The responsible job of "tanker dispatcher" is performed by Chief Warrant Officer Byrd W. Coolidge of Midlands, Texas, formerly a district field superintendent for Atlantic Refining. When preparations are underway for a new operation against the Japs, he is up to his ears in work fueling the various types of naval craft that are to take part in the action. He tells the combat ships where, when and how they are to load up their bunkers. Battleships and carriers usually take on their supplies from some of the numerous "yard" or "harbor" oilers that are constantly moving about the anchorage. Ships up to cruiser size generally are serviced by station oilers, such as the one where this staff of sea-going oil men make their headquarters.

Lieut. (j.g.) Clarence Wyatt of Wilmington, California, laughs off his duties with the remark that he is just the handy man of the staff. He hails from California Standard and has twenty-one years service with the company to his credit. When he joined the Navy he was head operator of Standard's marine terminal at San Pedro. Statistician of the staff is Ensign John C. Kehrli of Portland, Oregon, where he was a dispatcher at Tide Water Associated's marine terminal.

Above: Close-up of Fuel Lines.

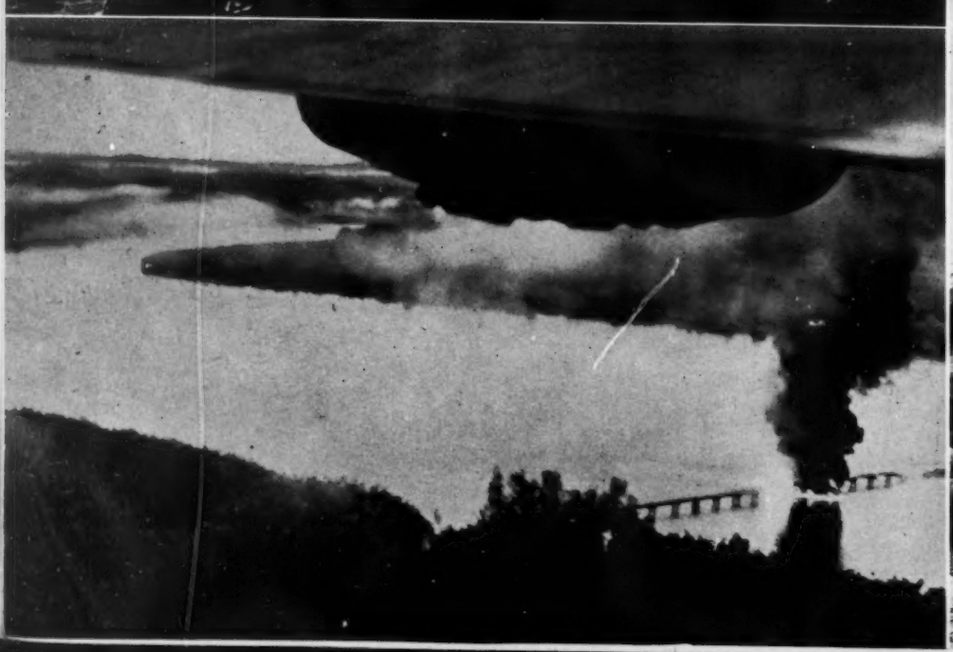
Top Right: Three Hastily Laid Pipelines Shortly After Iwo Jima Landing.

Right: Landing Oil Supplies at Leyte.

Lower Right: Blitz Cans of Gasoline Are Brought Ashore Behind Landing Forces.

Right: Supplies Going Ashore on Island Beaches.

Storage Tanks and Pipeline Being Installed on Iwo Jima.



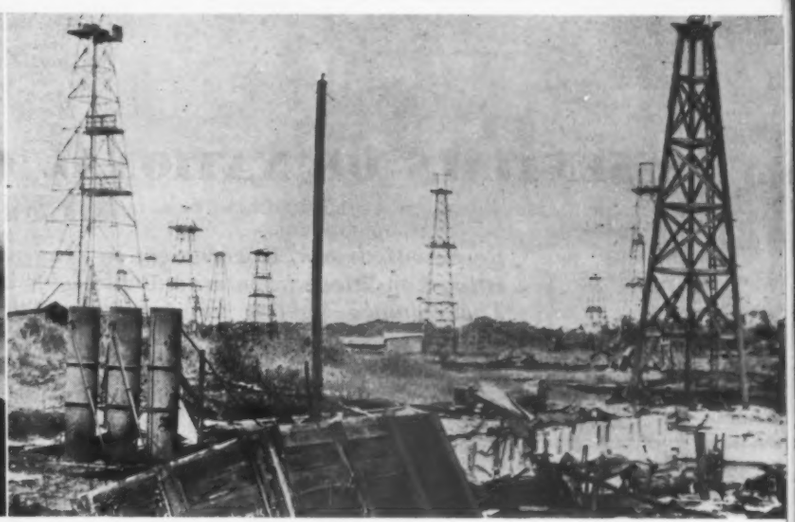
Left: Panoramic View of Balikpapan Refinery.

Lower Left: Four Direct Hits Blew up Dondang Bridge Which Supported Crude Oil Pipeline.

Balikpapan Burns in Fourth Great Strike.

Below: Gutted and Smashed Buildings Tell Story of Jap Destruction on Tarakan.

Lone Liberator Scored Direct Hit on Jap Storage Tanks at Lutong.



Tarakan Oil Fields Partially Destroyed by Fleeing Enemy.

SWEEP OF ALLIED ATTACKS ENGULFS JAPAN'S OIL SUPPLIES

BLOCKADE of Japan's main islands by the sea and air forces of the Allies has been effective for the past several months in shutting off almost all oil supplies from the East Indies. Now these oil producing areas are being taken over by Allied troops and are being reequipped to provide petroleum products to fuel a more intensive assault against the Nipponese homeland.

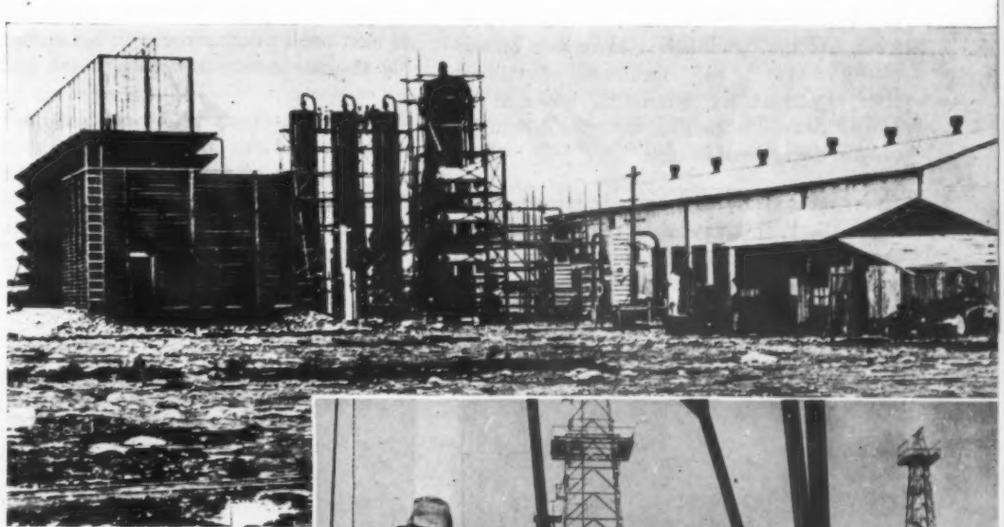
Close upon the heels of the Australian troops who recaptured the oil fields of Dutch and British Borneo came trained oil workers, including thousands of Indonesians who set to work to clear away the debris left by allied bombers, repair wells, restore ruptured pipelines and provide the means of resuming operation of some units of blasted refineries. So rapidly did this work progress tnat in the early days of July it was announced that oil was being supplied to the Pacific fleet for Tarakan, Brunei and Sarawak on the east and west coasts of northern Borneo while Japanese troops were still offering bitter resistance in the southern part of the big island.

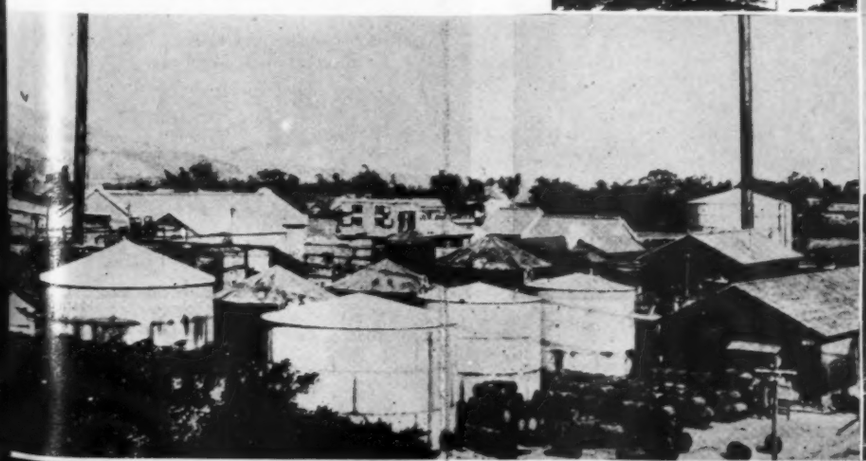
A hasty survey of the recaptured area revealed that the enemy had withdrawn so hurriedly that he had disturbed few of the wells that he had had in operation.

Production apparently had been going on at the rate of not more than 250,000 bbl. per month or only about one quarter of the average prewar production. The entire island had a monthly output of about 1,800,000 bbl. before the Japanese invasion so that a substantial increase in production may be expected once the whole area has been cleared of the enemy and cleaned up,

While the Allied commanders naturally have not announced their plans for further operations, it is reasonable to assume that the occupation of the other oil producing areas of Netherlands India of which Sumatra and Java are the most important will follow in due course. These may be of less immediate value to the Allies than Borneo because of the difference in the crude. Burma already has been redeemed and the oil resources on which the Japanese depended for oil and other essential supplies no longer can be included in the "Greater Asia Coprosperity Sphere."

Meanwhile the attack is being carried to the inner ramparts of the Empire with the rising tempo of bombing assaults on industrial plants, including oil refineries and storage facilities of Formosa and the home islands. As Allied air strength in the Pacific expands concentrated bombing of the entire industrial area may be expected to demolish remaining oil refineries and synthetic plants, to cut off shipments from Manchukuo and to reduce the remnants of the Empire to the same desperate straits in which Germany found itself before its surrender.





Right: Gasoline Plant at Chikuto, Formosa.
Lower Right: Experienced Personnel Repairing Wells on Tarakan.
Below: Taiwan Oil Refinery, Formosa.

ESSENTIALS OF NATIONAL OIL POLICY DEFINED FOR SENATE COMMITTEE

Representatives of Government and Industry Put on Record a Presentation of Past and Existing Conditions in International Fields and a Statement of Views as to Essential Factors That Should Govern the Course of the United States in Future Developments.

AFTER about a month of hearings, off and on, that dealt with a variety of topics related to the petroleum industry but not closely related to one another the Senate Oil Policy Committee, before recessing until September, finally put into the record a rather comprehensive presentation of facts and opinions on the nation's relationship to international developments in this field. For those who are interested in post-war planning for production and supply the sessions ended on a high note, with industry, the State Department, the Army, and the Navy speaking their views. Of the three government agencies, the War Department, with Brig. Gen. Howard L. Peckham, liaison officer and chief of Army's Fuels and Lubricants Division, as its spokesman, was especially concrete and to the point.

Army recommended four points that it said should be included in a national petroleum policy: (1) A pledge by the government to protect American nationals abroad in the pursuit and development of their legitimate enterprises and to support them in their legal rights. (2) Encouragement of foreign petroleum enterprises by United States nationals with a view to the importation of petroleuum to the United States to an extent consistent with the maintenance of a progressive and economically stable domestic petroleum industry. (3) Early adoption and implementation of the Anglo-American oil agreement and the "multilateral agreement contemplated therein." (4) Acquisition of military reserves outside the continental limits of the United States "when such course is determined to be in the national interest."

As for the development of petroleum resources at home, the War Department recommended that the national oil policy not only permit but encourage: (1) Conservation of domestic petroleum reserves by the maximum importation of petroleum consistent with maintenance of a healthy domestic petroleum industry. (2) Foreign petroleum enterprise by United States nationals. (3) Development of domestic petroleum reserves by such means and methods as will insure maximum total economic recovery of petroleum from every deposit now known or to be discovered in the future. (4) Exploration, development and conservation of the present Naval petroleum reserves to the extent necessary to render them a dependable asset in time of emergency. (5) Development of the technology of recovery of oils from shales and coal as a means of improving the nation's petroleum position.

The primary interest of the Army, General Peckham told the committee, is that in case of future war sufficient petroleum shall be available for all interests of national defense. He pointed out, as had been emphasized at previous hearings, that the problem of accessibility and transportation of oil during war means that the safest reserves for war use are those located within the country.

"The fact that these domestic reserves have been more extensively explored, developed and drawn upon than the reserves of other countries, and the uncertainty of future domestic discoveries," he declared, "make it essential that there be an increase in the production of foreign oil not only to meet needs in other countries but also to supply to some extent the needs of this country.

"Foreign oil resources, controlled by our nationals, are also important as an additional reserve in case of war. To the extent that accessibility and transportation permit, such foreign oil could be used in time of war to supplement domestic oil and thereby increase the oil available and also reduce the drain upon our domestic resources.

"Presumably our forces will occupy a number of bases outside of the continental limits of the United States in addition to providing armies of occupation in enemy countries. The supply of petroleum products to our overseas forces would be facilitated both in peace and in war if the sources of supply were conveniently located with respect to the areas in which they might be required."

On the domestic side of the picture, in spite of the necessity for a reserve supply of petroleum the War Department thought it "wholly impractical" for the United States government "to acquire, set aside and develop military reserves adequate to supply the entire increment of demand which would be occasioned by a future major war." The reason given was that such reserves should perhaps be "nearly equivalent to the total of all the present oil fields" in the country and with substantially the same degree of development for production.

Army's idea that the safest reserves are those at home was shared by the Navy Department spokesman Captain William G. Greenman director of Naval Petroleum Reserves.

"The armed services," Captain Greenman told the committee, "are absolutely dependent upon petroleum products for fuel and lubricants to carry out their several missions in defense of the nation. Substitutes and synthetics are not now sufficiently developed nor are they likely to be produced within a reasonable time in sufficient quantities to permit reliance upon them. Therefore, until a reliable substitute is available, national security demands an assured reserve supply of petroleum both above and below ground within the continental limits of the country ample for the needs of the nation in time of war. A commodity so absolutely vital to the very life

Brig. Gen. Howard L. Peckham

Charles Rayner

Capt. William G. Greenman

of the nation ought not to be entirely dependent upon foreign supply and water-borne transportation."

Captain Greenman praised the oil industry for its achievements during the war and expressed assurance of its future cooperation. "It is necessary, however," he declared, "that machinery now be set up in order that at the close of the war the close cooperation now existing between the armed services and industry may continue to the end that peacetime requirements may be coordinated with the establishment of a reserve supply so vital to the successful conduct of any future war."

Although not as specific and outspoken as the War Department spokesman, Charles Rayner, Petroleum Advisor of the State Department, agreed rather closely with the views on a national oil policy expressed by General Peckham. It is not in the interest of the United States, he stated, to run down its oil resources to a point where in time of emergency we would become "importantly dependent" on foreign sources "even to a greater extent than other major consuming countries." But this is a danger, he said, to which we expose ourselves unless we are prepared to import petroleum in quantities commensurate with the post-war levels of domestic production and consumption.

"The commercial policy of this government, moreover, aiming as it does at an expanding trade," Mr. Rayner said, "seeks to contribute by practical measures to maintain those conditions of peaceful economic relations with other countries which serve to prevent threats to peace arising from economic isolationism and its consequent enmities and dangers to national defense."

No one can say with certainty, whether or not quantities of petroleum to be obtained from new domestic sources will steadily decline or will increase. Educated guesses, he said, indicate that our reserves are being depleted at a rate that warrants our undertakings in conservation and technical research in new fuels.

In addition to these measures, he said, "prudent consideration" should be given to the outlook for national defense. With respect to petroleum national defense requires: (1) the maintenance of an efficient industry making the best use of the resources of this country, and (2) the assurance of continued adequate supplies of petroleum at least for several decades to come. Industry and government are now actively collaborating in the task of meeting the first requirement, Mr. Rayner declared, and the adoption of a sound commercial policy will contribute "in a significant manner" to the accomplishment of the second.

Mr. Rayner advocated a "strong" foreign oil policy for this country, one that "fully recognizes" our national interest in each of the oil areas of the world and "promotes a program of action that is commensurate with our national responsibilities and our future security." He said there never was any disagreement between the government and industry on the purpose and scope of the Anglo-American oil pact or on the desirability of such an international agreement. The difficulty, he said, arose through a misunderstanding of the provisions as expressed in the document itself.

On the question of government backing for its nationals' operation in oil fields abroad. Edward F. Johnson, general counsel for Standard Oil of New Jersey, told the committee that such a policy must rest on two underlying principles: (1) The operating programs of American private companies engaged in the oil industry abroad should be in accordance with the clearly defined policies of our government, broadly conceived, consistently maintained, and based on complete understanding and cooperation between such companies and the Department of State; (2) The oil industry in its foreign efforts should receive the wholehearted backing of its government. Not only is government backing in itself important but the whole world ought to know that the industry has consistent and continuing governmental support.

"In general," he said "there are two types of problems facing the American petroleum industry in its foreign operations. One is to obtain the right to operate in countries holding promise of oil production on a commercial basis and the other is to remain in a livable climate. The help of the Department of State is essential in each case."

Obtaining initial petroleum rights abroad is only part of the problem of foreign operation, Mr. Johnson said. A "steady, consistent and effective governmental policy" is essential to the petroleum industry to retain the extensive oil rights regally acquired and lawfully developed in many parts of the world. He thought a national oil policy adopted by Congress would go a long way in giving the State Department a charter to be followed "irrespective of the ebb and flow of public interest" and the oil industry "a basis for its own conduct in foreign operations."

Mr. Johnson told the committee that in international oil matters "the negotiation of treaties between this country and other countries is important." At present, he said, "international law principles, in themselves not always uniformly accepted or applied, govern in such matters. A treaty would embody specific conditions which would tend to eliminate much of the need for diplomatic intervention in the future and would tend to provide a recognized basis for intervention when warranted."

In the Middle East, he said, the American position seems to be established favorably. In the Netherlands East Indies prior to their occupation by the Japanese, Americans engaged in the oil industry "fairly acceptably." On the other hand, he pointed out, there are some countries with oil-producing possibilities from which American oil interests are either barred outright or are faced with inhospitable laws. In India and Burma the door is closed to them, and in the Philippines and China the laws relating to the production of oil favor their nationals to such an extent that Americans are not likely to participate in oil development there until the laws are substantially changed, although in the latter countries marketing operations were carried on prior to the war.

Charles W. Hamilton, vice president of Gulf Oil Corporation, told the committee that American oil men have carried their technique and know-how of oil finding, drilling, production and transportation to many foreign countries and have made them freely available to other nationals. They have trained thousands of local men in foreign lands to become drillers, geologists, engineers and oil field workers, he said, taking the place of Americans previously employed.

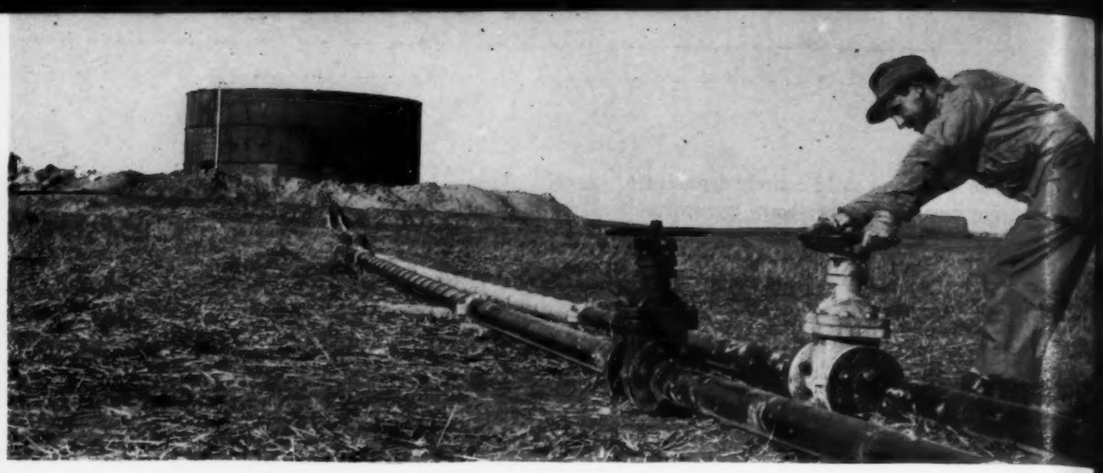
"So far as is now known," Mr. Hamilton said, "American oil interests do not share in either production or proved crude oil reserves in a total of nineteen foreign countries of the world, namely, Barbados, Bolivia, Brazil and Cuba in the Western Hemisphere, and Albania, Algeria, Australia-New Zealand, British Borneo, China, Czechoslovakia, Egypt, England, France, India-Burma, Japan-Taiwan, Russia, Sakhalin and Yugoslavia in the Eastern Hemisphere."

Walter L. Faust, vice president and director of Socony-Vacuum Oil Company, reviewed some of the early history of American marketing of petroleum in foreign countries. He declared that one of the major post-war problems of the American industry is to reconstruct a strong marketing position throughout the world.

"The known crude oil reserves today," Mr. Faust said, "are the highest on record and the oil industry will emerge at the termination of the war with greatly increased production of crude oil in the Middle East and in South America. Refinery facilities have been greatly expanded in this country, in the Middle East, Near East and in South America, to meet the war needs of the United Nations. The problem after this war is not one of production or refining but rather of finding a market for the available supply.

Mr. Faust cautioned that the trend today in the policies of some foreign countries indicates that the restrictions and discriminatory measure which were in effect prior to the war are to be continued and even increased. "It must be evident to everyone," he said, "that more than ever before our government, with the cooperation and advice of American oil companies, should endeavor to do all within its power to remove trade barriers, restrictions and other discriminatory measures."

Lt. Jesse L. Walden



WAR PIPELINES LEAD WAY TO VICTORY

By Lt. Jesse L. Walden

Skilled Men of the Engineers and Petroleum Distribution Companies Have Laid Thousands of Miles of Pipe Including World's Longest Line to Move Million Barrels per Day from Ports to Combat Areas.

Above: Making Valve Connection.

Left: Stringing Pipe Cross-Country for Army Line.

Brig. Gen. Thomas F. Farrell.

Top: One of the 10,000 Barrel Bolted Steel Tanks Used in the Pipeline System.

IT is a military axiom that "an army travels on its stomach".

It also travels on its gasoline!

General George Patton, Commander of the Third Army, once said when discussing his historic dash across France, that "at times gasoline was more important than food". For this reason gasoline has shared top shipping priority, with ammunition, since June 6, 1944. And, about one-half of the cargo shipped overseas has been gasoline.

The highly mechanized Allied armies require prodigious quantities of POL (Petrol, Oil, Lubricants) to keep them moving. In the first six months of 1945 a daily average of 141,000 tons was required to appease the insatiable appetites of our planes, tanks, bulldozers, trucks and other vehicles on the various fronts. Even the Infantry has three times as many vehicles per 100 men as were used in the last war.

Virtually all POL needed overseas is stored by the petroleum industry and delivered directly to tankers or in drums for overseas shipment. To insure fast distribution to front line units, the Quartermaster General purchased collapsible containers for both overseas storage and transport. Gasoline dispensing machinery and trucks were also purchased and shipped directly to theaters of operation. To further facilitate the rapid handling of petroleum products, the Corps of Engineers developed a military pipeline, through which it is possible to pump gasoline from tankers on a beach, virtually into the fuel tanks of a plane a thousand miles away. Portable pumping units for booster stations along the way were also developed by the Engineers, in cooperation with private industry, of course.

The war famous military pipeline first passed the acid test of battle in North Africa, and has since revolutionized the transport of liquid fuel in war. At present writing, approximately 11,000 miles of pipelines are in operation. These lines transport over 70 per cent of the POL required by our armies.

The most important feature of the military pipeline is that it is practically as portable as a tank truck. It is designed for speedy installation and use; many lines were laid in Europe at a speed of 50 miles a day, under enemy fire. It can be moved to cover the most fluid and swiftly shifting fronts.

Engineer POL Unit Setting Up Ship-to-Shore Distribution System.

Above: Suspension Bridge Carries Line Across River.

Top: Pumping Station Forces Oil Over Mountains Ahead.

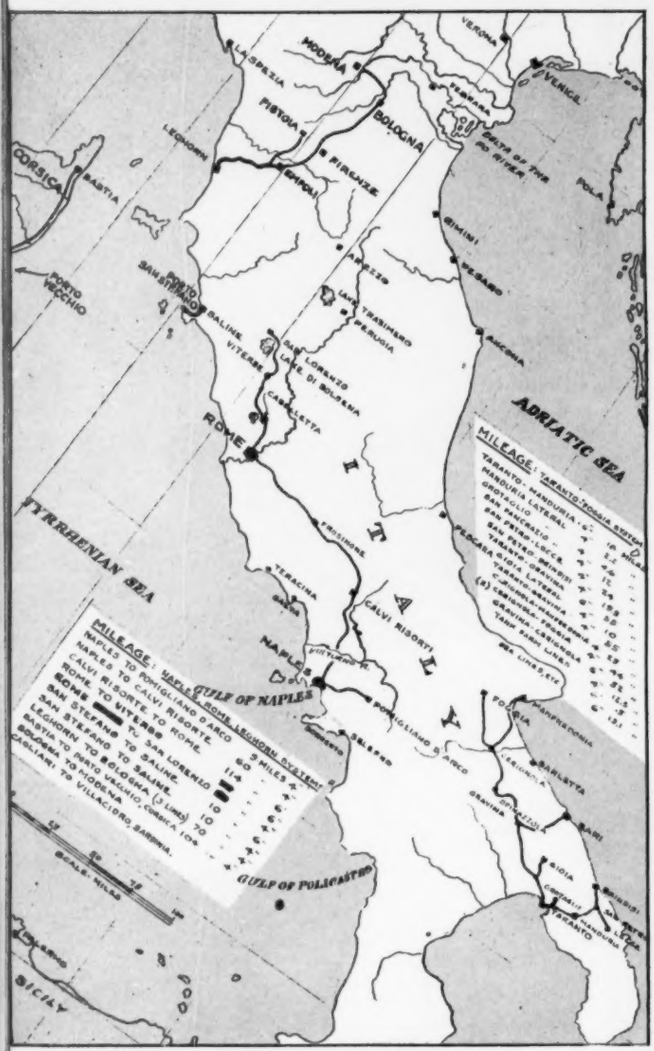
Above: P-47 Fighter Planes Refuel at Landing Base.

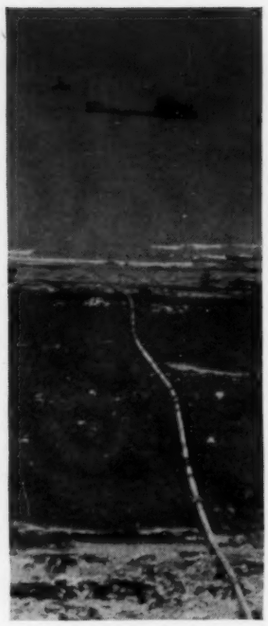
An Engineer pipeline crew was only 35 miles away when the first American entered Paris. A pipehead was established at Cassino within a few hundred feet of the front line. Later this particular point was recaptured by the Nazis. The loss was not known by the Petroleum Distribution Company until a Sergeant called up to ask about the flow; a German voice answered the phone, the Sergeant hung up and shut off the flow. Another interesting sidelight is revealed in a dispatch from Normandy, which told how Captain F. W. Thompson and his crew received the shock of their lives while surveying a route to supply oil to the advancing First Army, when an irate Brigadier General sent his aide to order Thompson and his men to "Get the hell out of there—the Infantry hasn't taken that field yet". Thompson obeyed.

An equally important feature of the military pipeline is the elimination of traffic congestion on supply routes and the economy of operation of the line. According to Major Robert W. Harrison, formerly executive officer of the Military Pipeline Service, ETO, the pipeline paralleling the "Red Ball Express Highway" in Europe released 8,000 trucks for other operations. Captain Frank Mesle, Office of Technical Information, OCE, estimates that 25,000 tank trucks, each of 2,000-gallon capacity would be required to operate each day to supply POL on all American battlefronts. Furthermore, it has been pointed out that tank trucks delivering gasoline over the Burma Road burned more than half their fuel in making the trip, while the gasoline powered pumping stations require considerably less than one per cent to keep up the flow.

In addition, camouflage is easy, as the pipes are painted to blend with the terrain, which makes them hard to spot from the air. They are even harder to hit and it is said a 100-pound bomb must strike within four feet to put a line out of operation. However, should the line be broken, valves are closed, automatically shutting off the flow. Gauges indicate the approximate location of a break which can be repaired or replaced speedily.

Portability of military pipe has been achieved by several factors, chief of which is the light weight of component parts. One mile of the 4-inch line, including pumping stations, weighs but 13 tons, or less than one-half of the weight of a normal line with a comparable 5,000 barrel-per-day capacity. Sections of the pipe are 20 feet long, and a section weighs less than 100 pounds. One Army truck and crew can easily carry and handle a thousand feet. The pipe itself is of longitudinal or spiral welded steel, is either four or six inches in diameter, and is designed to take an operating pressure of 250 to 400 pounds.



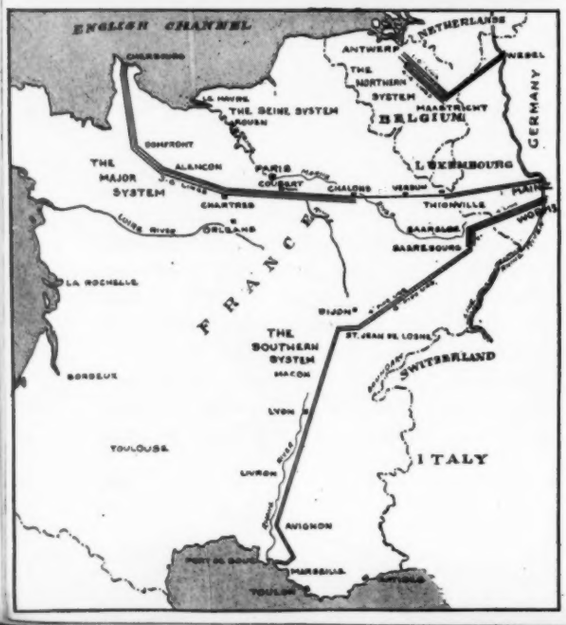


Top Left: Shore-to-Sh Line Laid Five Miles I land to Speed Unloadi of Fuels.

Top Right: Transferri Gasoline from Delive Trucks to Cans.

Left: Trestle Bridge Bu Over Rough Terrain.

Center Left: Joining P Sections with Victau Coupling.



Map Army's Italian Pipelines.

Pipe Lines—O. C. E. Western Europe.

The equipment is so simply designed that it can be easily installed or laid on any terrain accessible to trucks and can be put in operation in a very short time by a few skilled men. Pipe sections are fitted together with Victaulic grooved type couplings, which allow for angular deflection and contraction or expansion of the line. The coupling consists of a malleable iron housing in two parts, held together by two bolts, which engage the adjacent pipe ends in a positive lock.

Centrifugal pumps are used which have a working pressure of 700 pounds per square inch. Installed in series, the pumps deliver 200 barrels an hour at 200 pounds pressure. Pumping stations are mounted on skids and a complete pumping unit can be transported by one truck.

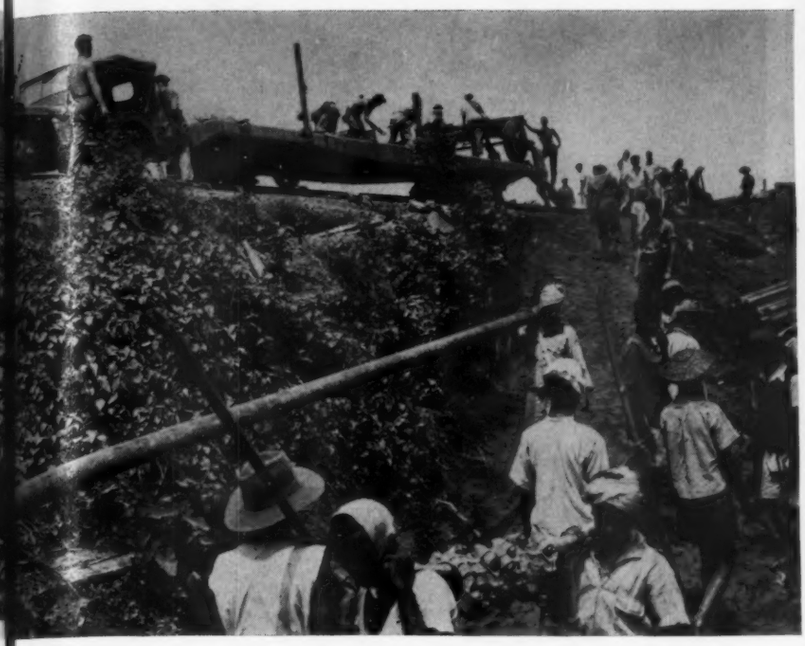
An integral part of the military pipeline is the bolted steel tank, successfully adapted from commercial use to meet the rigid requirements of war. These tanks range in size from 100 barrel to 10,000 barrel—420,000 gallon—capacities. The two major functions of the tanks are to provide storage space and to serve in a flow or operating capacity.

These tanks, like other component parts of the pipeline system are placed above ground, either directly on the surface or in open pits where they can be easily camouflaged. Whenever possible, tanks are dug in on a hillside, where they have the additional advantage of a positive gravity feed to the pumping stations below.

Special troops, known as Engineer Petroleum Distribution Companies install and maintain the military pipeline system. Commanded by a Captain, a company consists of seven officers and 214 enlisted specialists. A unit is theoretically expected to install and maintain 120 miles of line, including pumping stations and tank installations. The company, under the supervision of a Petroleum District, must be self sufficient in every way for, often as not, any given 120 miles of line will include any or all types of terrain as well as all battle and climatic conditions.

The oilfields of Texas, Oklahoma and California have provided the nucleus of seasoned personnel. However, all personnel assigned to this branch are given an intensive course of training at Camp Clairborne, Louisiana, in the techniques required for the installation and maintenance of pipelines, pumping stations and tank farms.

No story of military pipelines would be complete without mentioning the Petroleum Section, Military Operations, Office of Chief of Engineers. Headed by Lieutenant Colonel Arthur



Top Left: Pipe Arriving by "Jeep" Train Unloaded by Natives from Jungle Tribes.

Top Right: Unloading 4-inch Pipe for Ledo-Burma Line.

Right: Gravel Foundation Pipeline Which is Under Water During Monsoon.

D. Small—prewar chairman Engineering Committee, Wilcox Pool Association—and staffed by such men as Captain Joseph J. King of the Texas Company and a host of other petroleum specialists, this office has been instrumental in setting up the whole military pipeline systems; establishing the training center at Camp Clairborne; working out training manuals; procuring and standardizing material; in short, they have battled every conceivable odd since the inception of the branch in August, 1942.

While it is true that the military pipeline system handles over 70 per cent of the liquid fuel used by the armed forces, it is interesting to note some of the other distribution methods used since the beginning of the war.

Many thousands of barrels have been manhandled and floated ashore in 55-gallon drums and the 5-gallon jerricans. Railroad tank cars, the 2,000-gallon tank trucks, and drums or cans carried by ground vehicles and planes are in constant use on every front. Between March 31, when the Allied Armies east of the Rhine first began to outrun surface transport, and April 19, 1945, the Troop Carrier Command C-47's hauled 11,300,000 gallons of gas to the front lines from the pipeline terminals.

As stated previously, it was in North Africa that the military pipeline first demonstrated that it was one of the war's emergency triumphs. Over 1,000 miles of line, averaging 50 miles in length, were used in the African campaign. These lines supplied the Allied armies with approximately 170,000 gallons of gasoline a day. At first the lines extended from seaports to inland airfields and storage tanks; later, from inland storage points to front line bases, following the armies as they advanced.

In Italy the lines increased in length, radiating from four major ocean terminals to seven inland terminals, from which branch lines supplied fuel for the ground forces and to every major airfield.

The airfield branch lines became the keystone to the constant Allied bombing of the German armies and communication zone installations.

One of the principal originating points in Italy was at Naples, where tankers began unloading within a month after the city was captured and after Nazi demolitionists had completely destroyed the port. One pipeline, from Naples to Rome, had a capacity of 11,000 barrels in a 24-hour period; pumping stations were installed every ten miles.

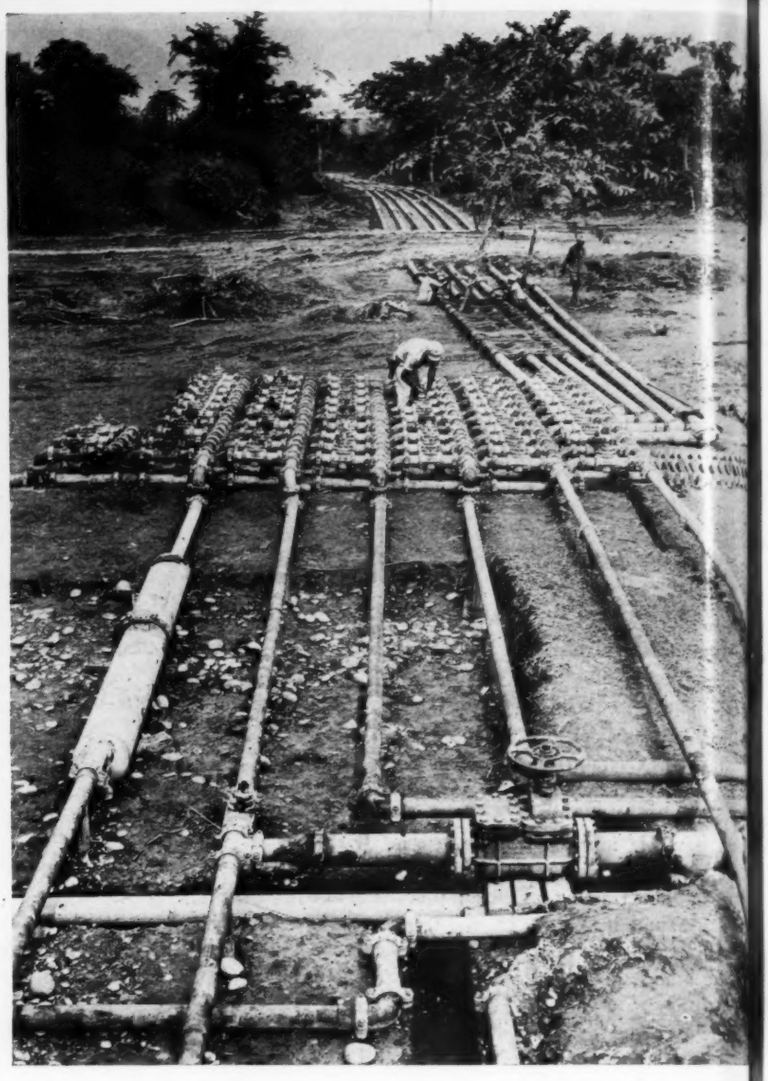
Other hundreds of miles of pipelines followed the liberating Allied armies in their advance up the Italian peninsula. These lines crossed rivers, climbed mountains, dropped over precipitous cliffs and traversed all other types of terrain found in that rugged country.

But it was when the race to keep American armored columns and planes supplied with POL gained momentum, following the Normandy invasion, that fuel distribution reached an all time high. Over 5,000,000 gallons a day were required to keep the mechanized offenses moving. In 1941, this would have been enough gasoline to drive every motorized vehicle in the world from New York to Chicago.

Some 3,800 miles of pipelines were laid on the Continent. This intricate system was composed of three separate systems running from Cherbourg to Mainz, Antwerp to Wesel and Marseilles to Mannheim. Spaced outlets, located every thirty to forty miles along the routes, were used as filling stations for Allied tanks, planes and rolling vehicles.

Millions of gallons of fuel were pumped through these lines from convoys of tankers rushed from England and the United States. Between D Day and V-E Day, 1,645,145,840 gallons were imported and delivered to depots and storage farms. More than 80 per cent of this tremendous stock was 80 octane motor gasoline, three-fourths of the remaining 20 per cent was aviation gasoline and the rest fuel oil and lubricants.

It was at the end of one of these lines that the biggest gas station in the world was operated. This one Quartermaster POL station fed the advancing armies a daily average of 900,000



Above: Constructing Gasoline Tank in China.

Right: Manifold Valve Installation Near Myitkyina, Burma.

gallons a day, and correspondingly huge amounts of oil and grease.

Military pipelines in Europe made history, but it was the building of the "Little Brother to the Ledo Road" that constituted what Congressman Mansfield, in a report to the House, called the "greatest engineering feat in the annals of the United States Army."

The saga of the world's longest pipeline—from Calcutta, India to Kunming, China—reveals one of the most remarkable achievements in the war against Japan. The line, was once the greatest "hush-hush" project of the China-India-Burma theater of war. Now, without revealing any military secrets, it can be stated flatly that the pipeline is more important than the famous Ledo-Burma Road, which it parallels, and is so regarded by Allied military chiefs. However, General T. F. Farrell, the builder of the line says: "The road and the pineline are really coordinate. Without the road the pipeline could not have been built, without the pipeline to support the road, construction difficulties would have been immeasureably greater."

The purpose of the huge project is to feed fuel to China, or as stated by Lieutenant General Daniel I. Sultan, "This pipeline is the artery through which we'll pump a transfusion into the sick body of China." The undertaking has no parallel in military history. The line was laid over every conceivable type of terrain—most of it terrible. Engineers estimate that one yard in every 250 covered was over rivers, gorges or ravines.

The weather worked in extremes. The sun was always very hot or the monsoon rains very heavy. The whole region has the unsavory reputation of being the unhealthiest portion of the world. Veterans of the Philippines, Central America and the South Pacific damned the country as the worst jungle of them all. The Bengal tiger, the king cobra and blood sucking leaches—which bored through the stoutest leggings and had to be scraped off with a knife—were far less dangerous than the unseen germs from which no part of this land is free and no man immune.

It was a kaleidoscopic scene of mud, insufficient and overtaxed equipment, rain, malaria, disappointment, heat, language difficulties, jungle fighting, landslides and homesickness. Yet the line went forward! By dint of prodigious expenditure of physical and emotional energy the units of one Petroleum District completed 1612 miles of pipeline from December, 1943 to April, 1945—an average of three and one-third miles a day, including the monsoon seasons!

Now, great tankers tie up at the Calcutta docks, bringing oil and aviation gas from the Middle East and other refineries to be disgorged directly into the pipeline. With only slight intervals between, Diesel oil, motor gasoline and lube oil run through the line one after another. Oil and gas from the Digboi fields in Northeast Assam also constitute a part of the liquid fuel carried to forward installations through the system. The line is portable in all respects except river and road crossings and hazardous spans in the mountains where heavy welded steel is used.

The Ledo-Burma line is a continuous system originating with a tanker unloading terminal at Calcutta; it follows the Brahmaputar Valley through Bengal and Assam; it crosses the Patkai range into northern Burma; then, on into China with the eastern terminus at Kunming in Yunnan Province. The line parallels the Ledo Road from Assam to the Road's junction with the Burma Road, thence into Kunming. Approximately 1800 miles of pipeline—nearly 400 miles longer than the Big Inch!

The line is divided into two sections. One section is a 6-inch line from Calcutta to Tinsukia in northern Assam, a distance of 750 miles, where it empties into large storage terminals. The second section consists of two 4-inch lines starting at Tinsukia and ending at Kunming, approximately 1,000 miles away.

The line was built by American, Indian and Chinese labor. Its progress can best be told by Brigadier General Thomas F. Farrell, formerly Chief Engineer, New York State, under whose direction this epic task was accomplished. General Farrell is now on duty with the Office Chief of Engineers, in Washington.

"In the fall of 1943", General Farrell says, "materials for the 4-inch lines began to arrive in the Ledo area, and in October the signal was given to begin construction. There were no trained personnel available, so Engineer general service troops were drafted. Work started at Digboi, Assam, where motor gasoline and high-speed Diesel fuel could be obtained from the Assam Oil Co.

"At first many difficulties were encountered and the untrained personnel made slow progress, but after a few weeks of practice these men were laying pipe like veterans and had completed 50 miles of the first 4-inch line before trained Engineer Petroleum Distributing Companies arrived to relieve them. On the second anniversary of Pearl Harbor the pipeline had delivered its first gasoline to Ledo, and the storage tanks at Mile O, official starting line of the Ledo Road, were filled. The first section of the Tinsukia-Kunming line was in operation, greatly easing the burden of moving motor gasoline by truck.

"Many difficulties confronted the crews as they progressed. Although the line paralelled the Ledo Road as closely as possible, many times the right-of-way had to deviate from the Road, due to the terrain. In some cases bulldozer traces had to be cut down and around a mountain in order to get pump equipment and pipe on to the proposed site. In one instance a whole pump station was dismantled and portered piece by piece four miles through the jungle and then reassembled on location. Numerous cable suspensions were constructed over the chasms that had to be spanned. For one 20-mile section reaching up to Pangsau Pass, one-tenth of the line had to be supported by cables.

"All this tended to slow down construction, but by February, 1944, the completed line was supplying gasoline needs for the first 50 miles; by the end of March as far as Shinbwiyang—mile post 102.

"Construction moved on south toward Tingkawk Sakan. The monsoon season began with full force, and mud and water seriously hindered the transportation of materials. Progress was slow and on many days only a few hundred feet of line was laid. However, by mid summer high-speed Diesel, motor and aviation gasoline was pouring through the line to Tingkawk.

"Past Tingkawk the line was pushed toward Warazup. Simultaneously work began on a line to Myitkyina, and from there another crew began a meeting line. Part of this would remain in place as a section of the permanent installation; the remainder isolated by a shorter route would be removed and reused elsewhere when its job here had been completed.

"On a section south of Warazup, the old native roads had become impassable. Water was four or five feet deep along the right-of-way. Material was hauled by plane or truck as far as possible; then dragged by tractor until the tractors were stalled by mud and water. Then pipe rafts and pontoons with outboard motors were called into play and the pipe was literally floated to the desired spot. Many times the men had to wade in water to their necks or waists to get the pipe strung; they worked all day in the same water to get it coupled. Progress was difficult, but four days before the deadline date of October 1, the pipeline to Myitkyina was completed.

"The surge of oil through the lines released many cargo planes and trucks for other critical needs. In a 24-hour period the lines have an 8,000 barrel capacity—approximately 336,000 United States gallons.

"While construction of the 4-inch line from Ledo to the east went forward, other major pipelines were under way. The first of these was a 6-inch line from Calcutta to Tinsukia, started in January, 1944, and placed in service along its entire length in August of the same year. This project was largely built during the monsoon season and was an outstanding performance. It was completed on schedule and has lived up to expectations in production, providing a major fuel supply for Northeast Assam and eliminating the difficult rail transportation up through the Brahmaputra Valley.

"Another major addition to the system was a line from the seaboard in Northeast Assam to the pipeheads in Tinsukia. The project was started late in 1944; a 10-inch sea unloading line was finished in April, 1945, and the whole line was in operation by May, 1945.

"The second 6-inch line to Tinsukia provided fuel for, first, the airplanes taking off from the Assam fields for the Hump flight to China; second, for all military activities in the region; and, third, for filling the pipelines which leads along the Ledo Road to China.

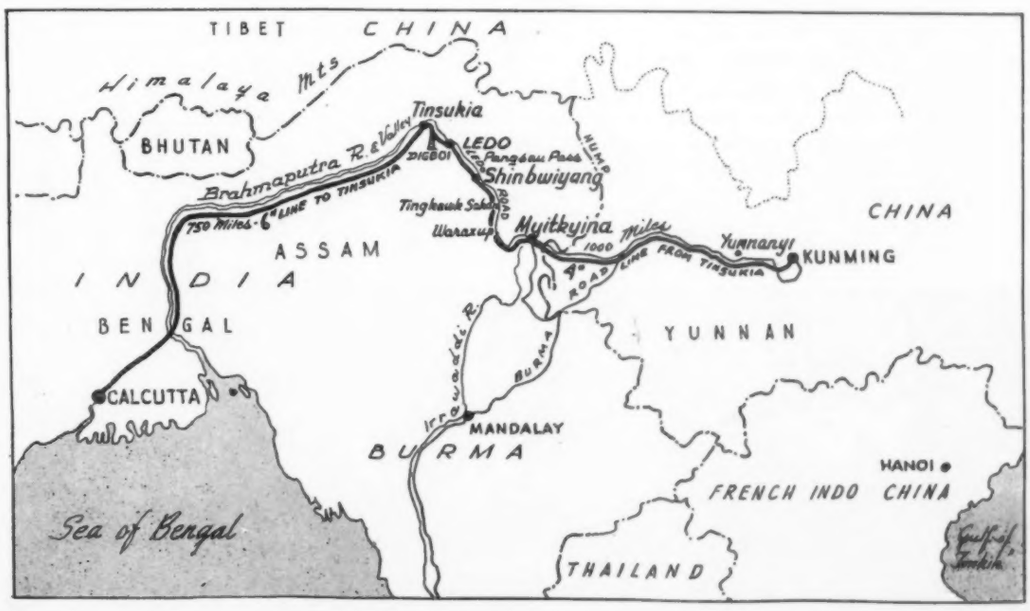
"Early in November, 1944, an advance party was flown over the Hump to Yunnanyi, China, to set up headquarters for the Petroleum Distribution Companies which followed soon afterward. On December 1, construction began in the China theater. At the same time the line was moving south from Myitkyina, on toward China, keeping pace with the Road. The pipeline into China became a reality in April, 1945.

"Three quarters of a million sections of 20-foot pipe were brought from America and hauled or flown to designated points along the pipeline routes. American labor supervised all construction. American supervision and labor was supplemented by over 7,000 tea garden coolies in the first stage and latterly by the Indian Pioneer Corps, 2,000 of whom were employed at one time.

"The vital urgency of the job was felt by all who worked day and night under the protection of sentries. While not an inch of the line was damaged by enemy fire, work on more than one occasion proceeded under Japanese assault. Throughout the monsoons, floods overflowed gum boot tops and malaria and dysentery caused real havoc with personnel. The work progressed amidst wild animals and poisonous snakes, while leeches, unwelcome but tenacious companions, not to mention other crawlers of the jungles, were a pest.

"It is impossible to describe all the day-to-day difficulties we had to surmount. The line crossed ranges in China that were over 8,500 feet high. At the peak of Pangsau Pass, four countries can be seen: China, Tibet, Burma and India. From Hell's Gate to Pangsau Pass, a distance of seven miles, the climb is straight up with 220 hairpin turns in the stretch. Equipment was buried under slides; six major bridges were swept away in one 24-hour period, and at Shinbwiyang the season rainfall was over 150 inches. The line was laid on rivers, over rivers and under rivers.

"Nevertheless, every problem faced sharpened resources of resolution. And these sturdy, determined Engineers who have overcome heartbreaking odds are still seeing it through—enabling more and more of the precious fuel to be pumped to China in the common cause—to lick the Japanese completely and as quickly as possible."



LAKE CREEK FIELD—AN EXAMPLE OF STATE CONSERVATION

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and
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INTRODUCTORY NOTE:
In the discussion of the relative merits of state versus federal regulation of oil field operations one of the arguments in favor of the exercise of state authority has been that through the greater familiarity of state officials with local conditions and the closer supervision they are able to exercise it is possible to regulate the practices employed in individual fields in accordance with their particular requirements. Clothed with discretionary authority such a state body is held to be in a position to fit its requirements to any situation that may arise to the end that sound practices of conservation may be enforced without undue interference with the utilization of the resources to which they are applied. The history to date of the Lake Creek Field in Texas is cited as a case in point. For this reason it is presented in the following article together with the orders of the Texas Railroad Commission applying to it.—Editor.

THE Lake Creek gas-condensate field, located in Montgomery County, Texas, is probably the richest distillate field in the State of Texas. This field is located about 37 miles northwest of the city of Houston, 11 miles north of Tomball, and 10 miles west of the great Conroe oil field.

The Lake Creek Field was discovered by the Superior Oil Company when it completed its T. A. McWhorter No. "A"-1 well on February 24, 1941, at a total depth of 9,314 feet in the Wilcox formation. The field was discovered by means of seismograph. The well was completed in what is known as the "A" zone of the Wilcox formation and perforated in a producing horizon from 9,212 to 9,217 feet below the surface. The first wells completed in the field were classified by the Railroad Commission of Texas as oil wells. The official potential test made under the Commission's supervision on the discovery well was on March 4, 1941, and showed on a 17/64" choke 170.5 barrels of hydrocarbon liquid of 60.8° API gravity and a ratio of 8,093 cubic feet per barrel. As additional wells were completed they were placed on the Commission's oil proration schedule and classified as high-ratio oil wells.

The second well completed was the T. A. McWhorter "A"-2 on June 27, 1941, at a total depth of 9,980 feet, with perforations at 9,228 to 9,242. The well was tested by the Commission on July 2, 1941, and made 197 barrels of liquid hydrocarbons with a gravity of 56° API on a 10/64" choke. The ratio was 5,365 cubic feet per barrel.

Subsequent to the completion of the T. A. McWhorter "B"-1 at a total depth of 13,330 feet, a hearing was called by the Railroad Commission of Texas to consider the application of The Superior Oil Company with reference to the conservation and prevention of waste of crude petroleum and natural gas in the Lake Creek Field.

This hearing was set for December 5, 1941, and on December 17, the Commission, on the basis of engineering evidence presented to it, reclassified the McWhorter A-1 and A-2 as gas wells. Wells drilled subsequently have proved that there are a number of gas-bearing formations in the field, rich in hydrocarbon liquid and yielding from 120 and 250 barrels per million cubic feet of gas.

Wells in the Lake Creek Field are classified according to the zones from which they produce. To date production is coming from 10 zones which have been designated and classified as follows: "1", "5", "A", "B", "C", "D", "E", "F", "G", and "H".

The table below shows that 23 wells have been completed as producing wells as of January 1945: Of the 23 wells completed, nine are triple completions, eight are dual completions, and six are single completions. Therefore, the 23 wells are equivalent to 49 wells, since dual and triple completions are considered by the Commission as two and three wells, respectively. From the list of completions it can be seen that Zone A and Zone B are the two zones which have been most developed; this is due to the fact that these two sands are fairly regular and continuous and are the richest sands in the field. The "A" sand yielding approximately 139 barrels per million and the "B" sand yielding approximately 180 barrels per million cu. ft. of gas.

The No. "1" zone found at 8800 feet and the No. "5" zone found at 9100 feet are classified as oil zones; and to date four wells have been completed as oil wells, three producing from the "1" zone and one from the "5" zone. As of March 1, 1945, a total of 39,234 barrels of oil had been produced from the oil wells.

Company and Lease	Well No.	Sand Completion	Mode of Completion
Progress Petroleum, Inc.			
J. M. Wenslow Est.	1	"C", "D" and "G"	Triple
Stanolind Oil and Gas Co.			
South Texas Dev. Co.	1A	#1 Oil Sd; "E"	Dual
McWhorter	1	#1 Oil Sd.	Single
McWhorter	2	"B"	Single
The Superior Oil Company			
Homer Browne	1	"B", "E", and "F"	Triple
C. A. Damuth	A-1	"A" and "B"	Dual
C. A. Damuth	B-1	"A" and "B"	Dual (Injection)
E. G. Frost	1	"G"	Single
E. G. Frost	3	"G"	Single
T. A. McWhorter	A-1	"A" "B" and #1 Oil Sd.	Triple
T. A. McWhorter	A-2	"A" and "B"	Dual (Injection)
T. A. McWhorter	A-3	"A"	Single (Injection)
T. A. McWhorter	A-4	"A" and "B"	Dual (Injection)
T. A. McWhorter	A-5	"A" "B" and "D"	Triple (Injection)
T. A. McWhorter	A-6	"A" and "B"	Dual
T. A. McWhorter	A-7	"B" "E" and #5 Oil Sd.	Triple
T. A. McWhorter	B-1	"A" "B" and "C"	Triple
T. A. McWhorter	C-1	"A" and "B"	Dual
T. A. McWhorter	C-2	"B" "C" and "D"	Triple
T. A. McWhorter	C-5	"E" and "F"	Dual
T. A. McWhorter	D-1	"A" "B" and "D"	Triple
South Texas Dev.	1	"B"	Single
South Texas Dev.	2	"B" and "H"	Dual

Camp for Cycling Plant Employees.

Production started June 1, 1944. Eleven wells are completed in Zone "A", sixteen in Zone "B", three in Zone "C", four in Zone "D", four in Zone "E", two in Zone "F", three in Zone "G", and one in Zone "H". Of the above completed wells, nine are injection wells; seven in the "A" zone and two in the "B" zone. The total cumulative production of condensate from 1941 to March 1, 1945, was 2,453,502 barrels, and the total cumulative gas production as of March 1, 1945, was 15,767,180,000 cubic feet.

Porosity and permeability determinations made by operators showed that the porosity of the sands ranges from 13 to 19 percent and the permeability ranges from 8 to 20 milli D'Arcys. Bottom-hole pressure tests made on the "A" zone showed a virgin pressure of approximately 3927 pounds per square inch with a temperature of 246° Fahrenheit. The pressures in both the "A" and "B" zones were considered at the dew point, and the "A" and "B" zones have been operated to maintain the reservoir pressures above the dew point.

Due to the richness of the various sands in condensate, a gas cycling and pressure maintenance plant was constructed in the Lake Creek Field. The plant is designed to process daily 68,500,000 cubic feet of raw wet gas produced directly into plant in the field. During the month of February, 1945, the plant processed 32,783,000 cubic feet of gas a day and returned 18,655,000 cubic feet to the "A", "B", and "D" zones.

The Lake Creek Field is the only field in the State of Texas which is required to be pressure maintained, and its production and development have been closely and efficiently supervised by the Railroad Commission of Texas.

After the completion of the first three wells in the field a hearing was called on December 5, 1941, to determine what rules and regulations should be promulgated to prevent waste and conserve the rich hydrocarbon liquids found in the various zones. On December 17, 1941, on the basis of evidence presented to the Commission by The Superior Oil Company that the liquids obtained at the surface from the McWhorter A-1 and A-2 wells exist in a gaseous phase in the reservoir, and that the liquid obtained at the surface is formed by a decrease in pressure and temperature which occurs after such gas leaves the reservoir, the Commission classified the two wells as gas wells, in accordance with the Commission Order of January 18, 1939. Since the January 18, 1939, order is of far-reaching importance as a conservation measure, it is quoted in its entirety:

WHEREAS, Article 6008 of the Revised Civil Statutes of Texas, 1925, as amended, vests in the Railroad Commission of Texas a broad discretion in the administration of such statute and to that end authorizes the Railroad Commission of Texas to adopt any and all rules, regulations and orders which are found necessary to effectuate the provisions and purposes of said statutes in the prevention of waste in the production and use of natural gas within the state; and

WHEREAS, Under other statutes, including Articles 6014, 6026, 6049a, 6049b, 6049c, and 6049d, the Railroad Commission of Texas is vested, authorized and directed to make and enforce rules, regulations and orders for the conservation of crude petroleum oil and natural gas and to prevent the waste thereof and to make and enforce all such rules, regulations and orders as may be necessary to that end; and

WHEREAS, The Railroad Commission of Texas and its agents and representatives have for the past several years made intensive studies concerning the classification of wells in the State of Texas which produce high gravity, highly volatile liquids at high gas-liquid ratios, the methods of producing such wells in order to obtain the greatest ultimate yield from the reservoirs in which said wells are located, and the proper utilization and disposition of natural gas produced from such wells. In connection with such studies the Commission has held hearings after due notice, including the hearings held on February 23, 1938, November 30, 1938, and December 13, 1938, and as a result of such studies and hearings the commission has found and concluded that there are numerous wells located within the State of Texas which produce a high gravity, highly volatile liquid which is usually termed 'condensate' or 'distillate', which liquid cannot be properly classified as crude petroleum oil as that term is generally known in the industry. The wells producing such products as are termed "condensate" or "distillate" are wells, with few if any exception, from which liquids are obtained at the surface, which liquids are in the gas phase in the reservoir and are formed by the decrease in pressure and temperature occurring after the gas in which such liquids are contained leaves the reservoir; and

WHEREAS, The Commission further finds that such problem as to the production of such condensate or distillate is encountered where natural gas is found at comparatively great depths and high pressures; and

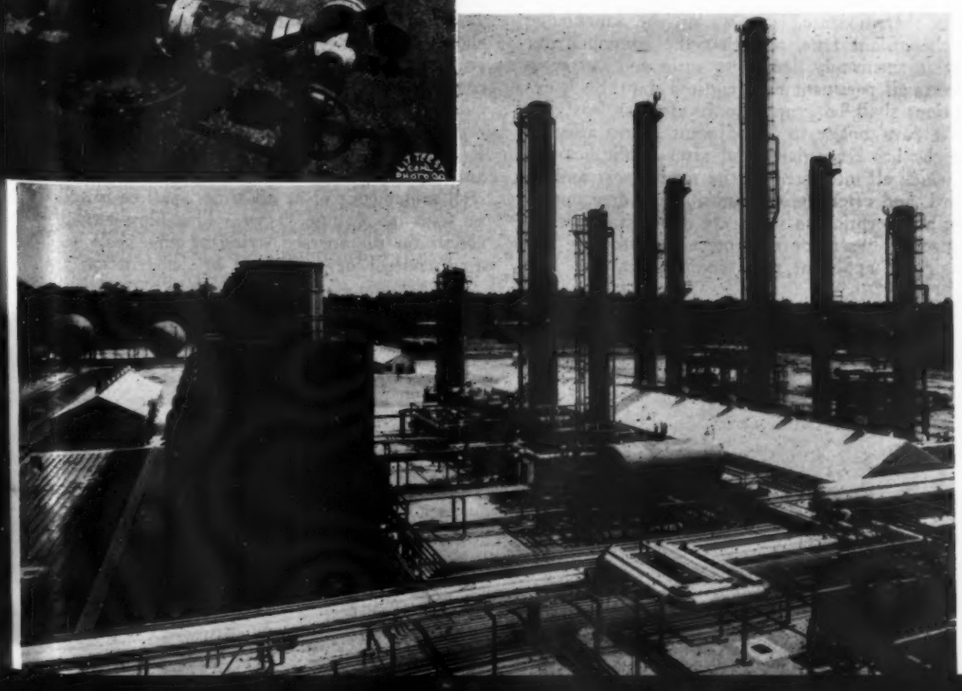
WHEREAS, The Commission further finds that if the pressure in such high pressure natural gas reservoirs is reduced, the gas-liquid ratio is increased if the conditions under which such liquid is separated from the gas remains the same; and

WHEREAS, The Commission further finds that numerous questions have arisen with reference to the administration of Article 6008 and other articles relating to the conservation of crude petroleum oil and natural gas in the State of Texas as to whether such wells producing such condensate or distillate may be properly classed as oil wells or gas wells within the provisions of such statutes; and

WHEREAS, The Commission further finds that a condensate well is one in which the liquid obtained at the surface are in the gas phase in the reservoir and are formed by the decrease in pressure and temperature which occurs after such gas leaves the reservoir, that such condensate wells produce hydrocarbon liquids which are usually water-white in color and are not crude petroleum oil within the provisions of Article 6008.

WHEREAS, The Commission further finds that if the pressure in a high pressure gas phase reservoir is allowed or permitted to drop, a liquid will condense out of such gas phase which liquid will wet the sand grains in the reservoir, and a large portion of the liquid formed in this manner will not be recoverable from the reservoir unless the pressure of such reservoir be raised back to original value; and

WHEREAS, The Railroad Commission of Texas further finds that in some fields in the State of Texas the operators of wells producing



Above: Dually Completed Producing Well Damuth A-1.

Left: Portion of Cycling Plant—Cold Process Cooling Tower: Pump House and Distillation Columns.

condensate or distillate are producing natural gas from such fields, extracting such condensate or distillate and then permitting such natural gas to be blown or released into the open air, resulting in tremendous waste of natural gas and failure to recover the large portion of the extractable liquid which remains in the reservoir unrecoverable; and that under the provisions of Article 6008 the gas produced from such wells may only be used for light or fuel purposes, efficient chemical manufacturing, repressuring gas lift in the production of crude oil, and recycling where such gas may be classified as sweet gas under the provisions of Article 6008, and where such gas is classified as sour gas under the provisions of Article 6008 same may also be used for the manufacture of carbon black under the conditions provided by such statute; and

WHEREAS, The Railroad Commission further finds that unless immediate and present orders, rules, and regulations are promulgated and enforced by the Commission such irreparable loss of natural gas will be continued to the great detriment of the state and its citizens:

IT IS THEREFORE ORDERED By the Railroad Commission of Texas that all wells within the confines of the State of Texas which producers hydrocarbon liquids which are condensation products from a gas phase are hereby classified as gas wells under the provisions of Article 6008 and the use of the natural gas produced from such wells shall be restricted to the purposes and use provided for in Article 6008 for the type of gas produced; that all wells producing hydrocarbon liquids, a part of which is formed by a condensation from a gas phase and a part of which is crude petroleum oil, shall be classified as gas wells, and the natural gas produced from such wells shall be devoted to the uses and purposes described and set out in Article 6008 as the purpose and uses for which natural gas from gas wells may be used, unless there is produced one barrel or more of crude petroleum oil per one hundred thousand cubic feet of natural gas; and that the term "crude petroleum oil" as used in this order shall not be construed to mean any liquid hydrocarbon mixture or portion thereof which is not in the liquid phase in the reservoir, removed from the reservoir in such liquid phase, and obtained at the surface as such.

IT IS FURTHER ORDERED By the Railroad Commission that this Docket shall be kept open for the reception by the Commission of any and all petitions or complaints as to hardships or any inequalities claimed to arise by reason of the operation of this order.

On the same date, December 17, 1941 the Commission promulgated field rules and regulations governing the drilling and completion of wells in the Lake Creek Field. This order concisely sets out the rules and regulations and is considered a good example of adequate but not restrictive control of the development of an important gas field. This order not only classified the various zones but includes a rule permitting dual and triple completions on a field-wide basis.

The rules have been amended from time to time in new sands. The last amendments were added August 7, 1944, and the whole order reads as follows:

WHEREAS, After due notice in the time and manner required by law a hearing was held on December 5, 1941, for the purpose of determining whether or not special rules, regulations and orders should be promulgated and adopted for the Lake Creek Field, Montgomery County, Texas; and

WHEREAS, It appears to the Commission from evidence submitted at this hearing and from a further study of said field by its engineers that waste, as defined in Article 6014, Revised Civil Statutes, 1925, as amended, will result in the drilling and operation of wells in the Lake Creek Field, Montgomery County, Texas, unless rules, regulations and orders are adopted for the prevention thereof.

THEREFORE, IT IS ORDERED By the Railroad Commission of Texas, that the following rules and regulations be and the same are hereby adopted effective January 1, 1942, as permanent rules and regulations to be maintained in effect in addition to the regular conservation rules and regulations of statewide application not in conflict with these special rules governing the Lake Creek Field, Montgomery County, Texas, or extensions thereof until further ordered by the Commission.

RULE 1. No well for oil or gas shall hereafter be drilled nearer than thirteen hundred twenty (1320) feet to any other completed or drilling well on the same or adjoining tract or farm, or nearer than four hundred sixty-six (466) feet to any property line, lease line or subdivision line; provided that the Commission, in order to prevent waste or to prevent the confiscation of property will grant exceptions to permit drilling within shorter distances than above prescribed whenever the Commission shall determine that such exceptions are necessary either to prevent waste or to prevent the confiscation of property. When exceptions to such rules are desired, application therefor shall be filed with the Commission fully stating the facts, which application shall be accompanied by a plat drawn to the scale of one (1) inch equalling four hundred (400) feet, accurately showing to scale the property on which permit is sought to drill a well under an exception to this rule and accurately showing to scale all other completed, drilling, and permitted wells on said property and accurately showing to scale all adjacent surrounding properties and wells. Such applications shall be verified by some person acquainted with the facts stating that all facts therein stated are within the knowledge of the affiant true, and that the accompanying plat is accurately drawn to scale and correctly reflects all pertinent and required data. Such exceptions shall be granted only after at least ten (10) days' notice to all adjacent lessees affected thereby has been given, and after public hearing at which all interested parties may appear and be heard, and after the Commission has determined that an exception to such rule is necessary either to prevent waste or to protect the property belonging to applicant from confiscation.

In applying this rule the general order of the Commission with relation to the subdivisions of properties shall be observed.

RULE 2. Except as hereinbefore provided, no more than one well shall be drilled to any one producing horizon for each unit of eighty (80) acres. Each operator shall indicate his contemplated development program on a certified plat submitted to the Commission, on which plat each well may be assigned to contiguous acreage up to eightly (80) acres; provided however that no acreage may be assigned to any well in the field which is located at a distance greater than twenty-seven hundred (2700) feet from said well, except in the case of tracts so narrow that the width of the unit includes the total width of the lease.

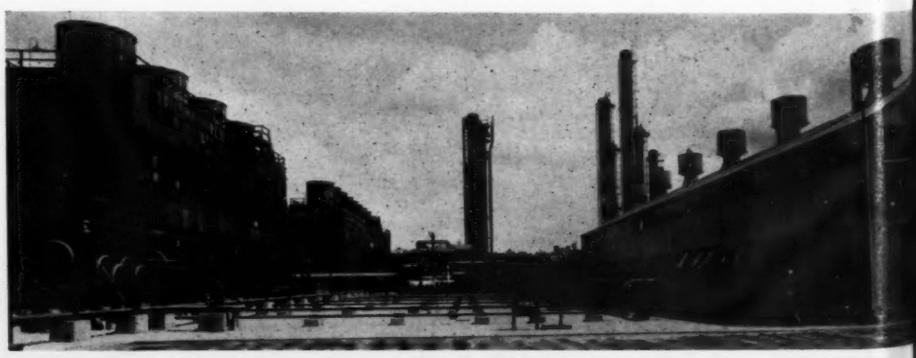
RULE 3. The casing program of all wells hereafter drilled in said field shall include at least two (2) strings of pipe set in accordance with the following program:

(a) A surface string of new or reconditioned casing that has been tested to a pressure of not less than sixteen hundred (1600) pounds per square inch shall be set and cemented at a depth of not less than fifteen hundred (1500) feet. Cementing shall be by the pump and plug method, using sufficient cement to fill the annular space back of the pipe to the surface of the ground.

Cement shall be allowed to stand a minimum total of twenty-four (24) hours before drilling plug or initiating tests. The surface casing shall be tested by pump pressure of at least one thousand (1,000) pounds per square inch applied. If at the end of thirty (30) minutes, pressure shows a drop of one hundred fifty (150) pounds or more, the casing shall be condemned and corrective measures required. After the corrective operation, the casing shall be again be tested in the same manner.

(b) The producing or oil string shall be new or reconditioned casing that has been tested to at least twenty-eight hundred (2800) pounds per square inch and shall be cemented with a quantity of cement calculated to sufficiently protect all productive horizons, but with not less than four hundred (400) sacks. Cement shall be allowed to stand a minimum total of forty-eight (48) hours before drilling plug or initiating tests. After cementing, the casing shall be tested by applving pump pressure of at least fifteen hundred (1500) pounds per square inch. If, at the end of thirty (30) minutes pressure shows a drop of one hundred fifty (150) pounds per square inch or more, the casing shall be condemned. After the corrective operation, the casing shall again be tested in the same manner.

RULE 4. A blow-out preventer, control head and other connections necessary for keeping the well under control at all times shall be installed as soon as casing is set. The blow-out preventer on the surface string of pipe shall be of dual control or such type of construction and



Compressor Building (Right); Pressure Injection Line (Center); Cooling Tower (Left).

operation as to satisfy any test which may be required by the Commission, and shall have been tested under hydraulic pressure of not less than four thousand (4,000) pounds per square inch. Blow-out preventer shall be tested at least once every twenty-four (24) hours; all control equipment shall be in good working order and condition at all times.

The position of the oil and gas producing horizons shall be determined by coring, testing or electrical logging, and the producing string set and cemented at, or below the top of, the lowest producing horizon. A blow-out preventer of at least three thousand (3,000) pounds working pressure shall be installed while drilling the well in.

RULE 5. All wells shall be equipped with a Bradenhead of at least three thousand (3,000) pounds per square inch working pressure. As soon as installed, the Bradenhead shall be equipped with the proper pipe connections accessible at the surface. Whenever pressure develops between any two strings of casing, the agent of the Commission shall be notified immediately. No cement may be pumped between any two strings of pipe at the top of the hole, except after permission has been granted by the Commission's agent in charge of the District in which the field is located.

RULE 6. All wells shall be cleaned into a pit not less than forty (40) feet from the derrick floor and one hundred fifty (150) feet from any fire hazard.

RULE 7. The authorized agent of the Commission is hereby authorized to make gas-oil ratio and/or bottom hole pressure tests on any well at any time, and the owner of such well is hereby directed to do all things that may be required of him by the Commission's Agent to properly make such tests.

RULE 8. All producing wells shall be equipped with tubing of not more than two and one-half (2½) inches in nominal diameter and the bottom of the tubing in such wells shall not be set higher than one hundred (100) feet above the top of the sand which is to be produced through said tubing. However, input wells may be equipped with tubing whose nominal diameter is greater than two and one-half (2½) inches.

RULE 9. All flowing wells shall be equipped with adequate chokes or beans to properly control the flow thereof.

RULE 10. All flowing oil wells must be produced through an oil and gas separator of ample capacity and in good working order. Sufficient tankage shall be provided to permit the proper taking of the allowable production. Lease or working tanks shall be so operated as to permit proper gauging.

RULE 11. All wells producing two (2) percent or more salt water must be reported by their owner or operator to the Commission's agent at Houston, Texas.

RULE 12. No boiler or electric lighting generator shall be placed or remain nearer than one hundred fifty (150) feet to any producing well or oil tank.

RULE 13. Each permanent oil tank, or battery of tanks, must be surrounded by a dyke, or fire wall, with a capacity of at least one and one-half (1½) times that of the capacity of the tank or battery of tanks.

RULE 14. Any rubbish or debris that might constitute a fire hazard shall be removed to a distance of at least one hundred fifty (150) feet from the vicinity of wells, tanks, and pump stations. All waste shall be burned or disposed of in such manner as to avoid creating a fire hazard, or polluting streams and fresh water strata.

RULE 15. When coming out of the hole with the drill pipe, drilling fluid shall be circulated until equalized and a fill-up line shall be turned into the casing to insure a full load of fluid on the bottom of the hole at all times.

RULE 16. From evidence of record, the Commission finds that the "1", "5", "A", "B", "C", "D", "E", "F", "G" and "H" sands (hereinafter defined) form individual and distinct reservoirs which are separated from each other by impervious formations and that:

(1) The number "1" sand referred to herein is that producing zone found in The Superior Oil Company's T. A. McWhorter A-6 well from a depth of eighty-seven hundred ninety (8790) feet to eighty-eight hundred thirty-five (8835) feet, which zone is three hundred twenty-two (322) feet below the top of the Wilcox formation in said well.

(2) The number "5" sand referred to herein is that producing zone found in the Superior Oil Companys' T. A. McWhorter A-7 well from a depth of nine thousand sixty-five (9065) feet to ninety-one hundred sixty-five (9165) feet, which zone is six hundred eight (608) feet below the top of the Wilcox formation in said well.

(3) The "A" sand referred to herein is that producing zone found in The Superior Oil Company's T. A. McWhorter A-2 well from a depth of ninety-two hundred eighteen (9218) feet to a depth of ninety-two hundred eighty-two (9282) feet, which zone is approximately seven hundred twenty-eight (728) feet below the top of the Wilcox formation in said well.

(4) The "B" sand referred to herein is that producing zone found in The Superior Oil Company's T. A. McWhorter A-2 well from a depth of ninety-seven hundred forty-four (9744) feet to a depth of ninety-seven hundred seventy-nine (9779) feet, which zone is approximately twelve hundred fifty-four (1254) feet below the top of the Wilcox formation in said well.

(5) The "C" sand referred to herein is that producing zone found in The Superior Oil Company's T. A. McWhorter B-1 well from a depth of ninety-nine hundred forty-five (9945) feet to a depth of ten thousand ten (10,010) feet, which zone is approximately fourteen hundred twenty-five (1425) feet below the top of the Wilcox formation in said well.

(6) The "D" sand referred to herein is that producing zone found in The Superior Oil Company's T. A. McWhorter B-1 well from a depth of ten thousand two hundred (10,200) feet to a depth of ten thousand two hundred ninety (10,290) feet, which zone is approximately seventeen hundred (1700) feet below the top of the Wilcox formation in said well.

(7) The "E" sand referred to herein is that producing zone found in The Superior Oil Company's T. A. McWhorter A-7 from a depth of ten thousand nine hundred ninety (10,990) feet to eleven thousand twenty (11,020) feet, which said zone is approximately two thousand five hundred thirty (2,530) feet below the top of the Wilcox formation in said well.

(8) The "F" sand referred to herein is that producing zone found in The Superior Oil Company's Homer Browne No. 1 well from a depth of eleven thousand two hundred sixteen (11,216) feet to eleven thousand four hundred forty-six (11,446) feet, which zone is twenty-seven hundred thirty-five (2735) feet below the top of the Wilcox formation in said well.

(9) The "G" sand referred to herein is that producing zone found in The Superior Oil Company's Eola G. Frost No. 1 well from a depth of eleven thousand four hundred seventy five (11475) feet to eleven thousand seven hundred two (11,702) feet, which zone is approximately three thousand five (3,005) feet below the top of the Wilcox formation in said well.

(10) The "H" sand referred to herein is that producing zone found in The Superior Oil Company's South Texas Development Company No. 1 well from a depth of eleven thousand six hundred sixty-five (11,665) feet to eleven thousand nine hundred fifty-two (11,952) feet, which zone is approximately thirty-one hundred sixty-eight (3168) feet below the top of the Wilcox formation in said well.

RULE 17. The commission further finds that it is in the interest of and an aid to conservation to permit dual and triple completions of any gas well found to produce gas in the "A", "C", "D", "E", "F", "G", and "H", sands (hereinabove defined), and such completions in gas wells in said sands may be made provided the operator of such well or wells submits to the Commission the following information.

(1) An electrical log of each of such wells showing the location and extent of the sands encountered therein together with the designation of each sand and the description of those sands to be involved in the dual or triple completion that is desired.

(2) A drawing of the proposed method of completing the well showing the method to be employed in producing each completion therein and the method that is to be used to effect separation of the sands.

Gasoline and Liquified Petroleum Gas Storage.

All dual and triple completions must be made as to absolutely prevent migration, or movement, of gas or fluids from any one sand to another sand. In order to prevent any migration or movement of gas or fluids between sands all dual completions shall be made in the following manner:

Casing shall be set and cemented through the upper producing horizon, or horizons, as outlined in Rule 3; however, the casing may be set at, or below, the top of the lowest producing horizon penetrated but shall be cemented as provided in Rule 3. The upper zone shall be perforated and a formation test made of this horizon; in like manner, the lower zone shall be tested separately from the other zone. These tests shall be witnessed either by the representative of an offset operator or an agent of the Railroad Commission of Texas. In the event intercommunication between zones behind the casing is indicated by the formation tests outlined above, corrective measures shall be applied and each formation again tested separately in the presence of qualified witnesses as above set forth. In the event the tests indicate that there is no intercommunication between the zones on the outside of the casing, the operator may proceed with a dual completion as outlined below.

A packer shall be set which will effectively prevent the the migration of gas or fluids from one zone to the other. Additionally, tubing with a circulating port above the packer which will permit testing the upper horizon through the tubing, shall be run. All packers shall be properly tested for leakage.

In order to prevent any migration, or movement, of fluids between sands, all triple completions shall be made in the following manner:

Casing shall be set and cemented through the upper producing horizons, or horizon, as outlined in Rule 3. However, the casing may be set at, or below, the top of the lowest producing horizon penetrated and shall be cemented as provided in Rule 3. The upper zone shall be perforated and a formation test obtained of this horizon; in like manner, the next lower zone to be produced shall be tested separately from the other zones; in like manner, the third zone to be produced shall be tested separately from the other zones. These tests shall be witnessed either by a representative of an offset operator or an agent of the Railroad Commission. In the event intercommunication between zones behind the casing is indicated by the formation tests outlined above, corrective measures shall be applied and each formation again tested separately in the presence of qualified witnesses. In the event the tests indicate that there is no intercommunication between zones on the outside of the casing, the operator may proceed with a triple completion as outlined below.

A packer shall be set between the lowest zone and the upper two zones which are to be produced. The above packer shall effectively prevent the migration of gas or fluids from the lower zone to either the upper zones. Tubing, with a circulating port above the packer, which will permit the testing of the next higher horizon through the tubing, shall be run. A packer shall be set between the two upper zones to be produced. This packer must effectively prevent the migration of gas or fluids between either of the two upper zones. As inner string of casing with a circulating port above the upper packer shall be run. All packers shall be properly tested for leakage.

RULE 18. From evidence of record the Commission further finds that physical waste will be prevented and sound conservation best served by allowing gas to be produced from the "G" and "H" sands until the bottom-hole pressure in these two sands shall have reached four thousand (4,000) p. s. i., provided such gas so produced from the "G" and "H" sands (less such losses as may occur in processing to recover the condensate contents thereof) be introduced into the "A", "B" or "D" sands in order to maintain and increase the rock pressure and increase the ultimate recovery from such horizon or horizons; provided further, however, that the bottom-hole pressure of the producing horizons or sands into which such gas is so introduced shall never be raised to a point greater than the original bottom-hole pressure thereof.

The Commission further finds, based on evidence, that the productive "C", "E" and "F" sands occur as small isolated lenses separated from each other by impermeable streaks and that conservation will be best served by permitting gas to be produced from the "C", "E" and "F" sands and the residue thereof introduced to the "A", "B" or "D" sands in order to maintain the reservoir pressures and increase the ultimate recovery of such horizons or horizon; provided, however, that the bottom-hole pressure of the producing horizon or sands into which such residue gas is so introduced shall never be raised to a point greater than the original bottom-hole pressure thereof.

RULE 19. From evidence of record the Commission further finds that it will be in the interest of conservation to permit and The Superior Oil Company of California is hereby authorized and permitted to operate its recycling plant in the Lake Creek Field and to take gas from the "A", "B", "C", "D", "E", "F", "G" and "H" sands, to process this gas for its liquid hydrocarbon content and to inject the resultant residue gas into any of said sands by means of suitably located input wells provided the re-injection of said residue gas shall be made into the same sands from which it was produced and in the same amounts save and except the "C", "E", "F", "G", and "H" sands which may be produced in accordance with Rule 18 herein.

No gas well in said field shall be permitted to produce in any allowable period a volume of gas greater than twenty-five (25%) percent of its potential capacity; provided, however, the volume of gas so permitted to be produced may be computed on the basis of net gas produced. The term "net gas produced" as used herein is defined as the difference between the total volume of gas produced from a well and the volume of gas produced from said well that is returned to a producing formation in said field according to provisions of other rules herein, after the gas has been efficiently stripped of its liquid hydrocarbon content.

IT IS FURTHERED ORDERED, That this cause be held open on the docket for such other and further orders as may be necessary and appropriate in the premises.

In August, 1943, The Superior Oil Company of California completed its recyling plant at a cost of four and one-half million dollars; and by that time the company had completed 13 wells producing from the various zones, while the Stanolind Oil and Gas Company, the other operator in the field, had completed two wells in the "B" zone and was drilling two more wells in the field. No gas had been produced from Stanolind's wells except for the purpose of supplying their drilling needs. Now, however, The Superior's plant is connected to Stanolind's wells and Progress' well.

Prior to the completion of the cycling plant, The Superior Oil Company completed their McWhorter No. A-6 and A-7 wells. As a result of the above completions and also due to the fact that their plant was now operating, The Superior Oil Company requested that the Commission call a hearing to classify and designate a sand found at 8800 feet in their A-6 well and a sand found at 9100 feet in their A-7 well and to determine whether any gas sand in the Lake Creek Field shall be permitted to be produced as a result of a dual or triple completion unless the residue gas is returned to producing horizon in accordance with the rules of the Commission.

The hearing was called by the Commission and was held March 24 through March 27, 1944. At this hearing geologic and engineering data were presented by The Superior Oil Company and the Stanolind Oil and Gas Company to prove that the newly discovered 8800-foot sand and the 9100-foot sand were oil sands.

The position of The Superior Oil Company was that less waste would occur in the field by maintaining pressure in the "A", "B", and "D" sands by taking the resultant residue from the other sands and reinjecting it into these richer sands than would result if each sand were recycled with the residue which results from the processing of its own production. Under this theory The Superior justifies its not repressuring the "F", "G", "H", "C" and "E" sands. Sufficient gas is not available to maintain pressures in all sands. Engineering data presented to the Commission showed that the permeability in all the sands is very low, rang-

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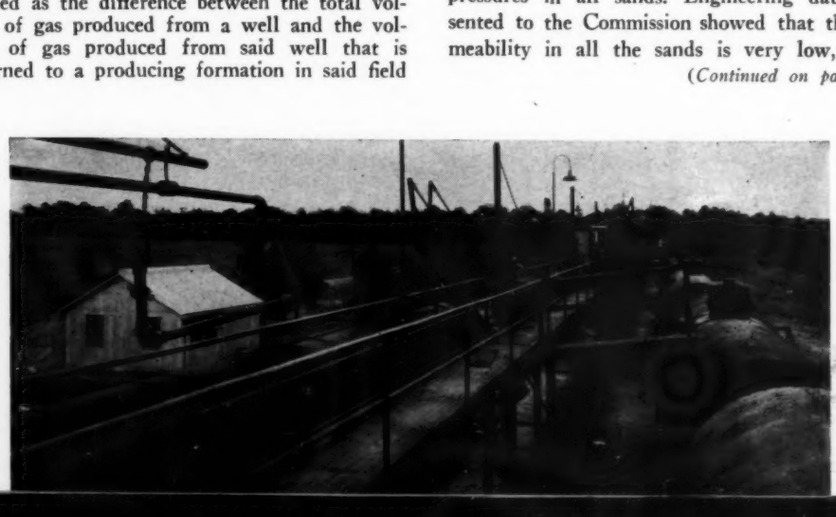


Loading Rack at Cycling Plant.

Below: Bi-motored Martin Mariner in a Jet Assisted Take Off.

Left: Jet Propelled Bell P-59A Airacomet.

TOMORROW'S AUTOMOTIVE FUELS AND ENGINES

By Dr. O. W. Willcox

NOW that the world has passed the half-way mark toward peace, the petroleum press and the automotive press, and much of the daily press, are carrying reports of speeches, interviews and scientific papers in which an effort is made to picture the new world of oil-powered transportation that is opening before us. Much of this prognastication is purely crystal gazing, presenting visions of new fuels of fabulous efficiency and economy, of wonderful automobiles and airplanes of marvelous speed, carrying capacity, comfort, and convenience. On the other hand, a good deal of level-headed stock-taking is being done by men and companies who have to plan their next moves on realistic estimates of current and future prospects.

From the realistic standpoint one basic assumption can be safely made, which is that the petroleum industry can supply any demand that the automotive people can possibly make in respect of the quality and quantity of fuels and lubricants now or hereafter to be needed by the land, seagoing, and aeronautical automotive engines and vehicles of the future. Wherever man wishes to travel, whether merely on the road or through the stratosphere or the bathyspere, and whether the path is beset by sub-arctic cold or super-torrid heat, the petroleum industry is prepared to furnish him with adequate power and proper lubrication. What kind of fuels and lubricants the oil refineries are to be required to turn out will, therefore, depend on what the automotive engineers need or think they need for their engines.

Another thing that can be safely counted on is that the petroleum industry will enter the post-war period with a large backlog of assured business. It is said that there are now more than three billion horse power in the internal combustion engines in the United States, and these engines must continue to rely on liquid petroleum

fuels of one kind or another. A small number of engines will run on natural or manufactured gas. Efforts are continually being made to run internal combustion engines on powdered fuel, but most informed opinion is that these efforts have little chance of success with the solid fuels now available. The only possible rivals of petroleum fuels in this field are anhydrons, alcohol and generator gas, which cannot compete unless strongly supported for political reasons, and then only on a very restricted scale.

Although it is certain that petroleum fuels must continue to be burned to produce billions of horse power, the amounts of these fuels, and the forms in which they will be consumed are matters in which there is likely to be much modification in detail, some of which, under certain contingencies, may well be of a drastic and revolutionary nature. For the present, however, the automotive engineers are making up their minds as to the kinds and qualities of fuel they will need for the 2½ billion horse power represented by the existing types of spark-ignition engines, the great majority of which are used to power automobiles, trucks, and airplanes.

The dominant purpose of every designer of internal combustion engines is to get the most power from the smallest amount of fuel burned in an engine that has the smallest weight per horse power. Aside from the desire for the smallest and lightest possible engine, the principal aim is to reduce fuel consumption, which of course, will work toward reducing the gallonage that the oil refiners will be called on to supply. This is all right with the refiners, who have never shown the least hesitation in co-operation with the automotive engineers in developing high quality and economical fuels. In fact, the refining art has now gone far ahead of the engine builder who not only has 100-octane gasoline at his disposal, but also fuels like triptane and other highly branched paraffin or mixed hydrocarbons. It can thus be said that whatever improvements are hereafter to be made in economical automotive operation must come through the process of perfecting the engines.

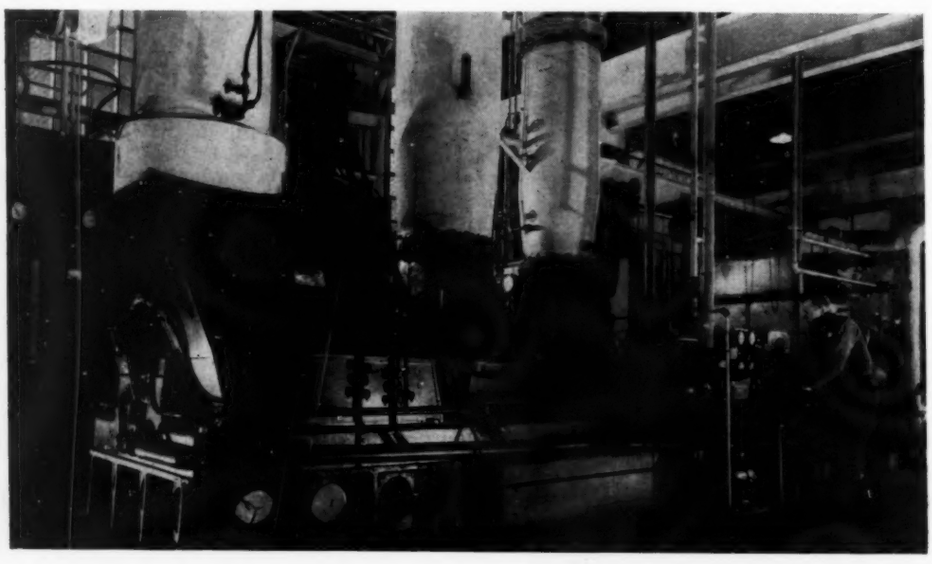
The task of the engine builders grows out of the fact that the gasoline engine is a heat engine which has to be made to yield more and more foot pounds of energy per unit of space for internal combustion. The most obvious way to increase the power of the engine and at the same time to decrease its weight is to burn more fuel in the engine's cylinders, that is, to increase the compression ratio. The evolution of the gasoline engine has been following this line for a long time. Back in 1908 the compression ratio was 2.5 to 3.5; by 1940 it had increased to around 6.1, and the number of cylinders was increased from four to six and more. With these improvements the weight of the engine per brake horse power came down from 35 lbs. in 1905 to 10 lbs. in 1940. The r.p.m. of the engines increased from 1000 to 3000, the piston displacement dropped from 380 to 330, the output of horse power increased six-fold to 100 H.P., and the road speed rose from 9 to 50 and more miles per hour.

On the principle that the past is the key to the future, the engineers who are designing the automobiles of tomorrow confidently expect a continuation of this line of evolution toward smaller and more powerful engines, and that the evolutionary process will be speeded by the greater knowledge that has been acquired under the stress of the war effort. The problem is now to take full advantage of the superlative fuels which the oil refiners can supply. Reduction in the weight of the engine and an increase of its efficiency now depends only on increasing the compression ratio. This is easier said than done, and before it is done the present engines will need further improvement, because when the compression ratio is increased and the pressure boosted to take full advantage of the anti-knock valve of the fuel we encounter the phenomena of preignition, a condition which is full of trouble, and which becomes dangerous when the ratio of 10:1 is approached. Overcoming this obstacle is now seen to be a matter of design, which will include better cooling, better carburetors and more even fuel distribution. It is now considered reasonable to expect engines weighing two pounds per horse power (compared with the present six pounds), with 0.55 to 0.6 horse power per cubic inch. of displacement in normally aspirated engines, and more with supercharging. At the same time the total weight of the average car, now about 3000 pounds, will be reduced to 2500 or 2000 pounds by the use of lighter and stronger materials. This decrease in weight, combined with greater attention to aerodynamic design and improved engine efficiency will very surely give us cars that should run up to 30 miles on one gallon of gasoline.

What effect will this increase of miles-per-gallon have on the gallonage output of the oil refineries? It would seem that doubling the efficiency of a gallon of gasoline would halve the amount of gasoline required by the motorists. From the standpoint of conserving an irreplaceable natural raw material this would be an excellent result, but it is not pleasant for oil men to contemplate a corresponding shrinkage of the present dimensions of their industry. But this development, though apparently in the offing, is still rather distant. There are still about 25,000,000 old cars on the road which will go on consuming gasoline as usual, and on account of the difficulty of obtaining better materials for bearing, etc. the new post-war cars will have to be 1942 models, with only normal changes such as improved appearance and gadgets. Spokesmen for the automobile industry say that the average man will not be likely to get a new car before 1947, and that at least five years will be required to replace the old cars that await scrapping. By 1950 the public should be driving 34,000,000 automobiles—6,400,000 more than at the pre-war peak. In addition to this increase of cars on the road there will be more commercial and private flying, more home heating, more diesels, more tractors, more plastics and more chemical specialties based on petroleum materials, and a greater demand for lubricants, all of which should add up to at least the same if not a greater gallonage of total petroleum output.

At any rate, the executives of many oil companies who are laying out their future programs are not displaying much uneasiness about their prospective volume of business. In response to an official questionnaire on what new equipment the refiners of the United States expected to need after the war it was learned that orders would be placed for some $90,000,000 worth of catalytic cracking equipment, $7,500,000 worth of alkylation plants and naphtha isomerization facilities for boosting octane ratings, together with $19,000,000 worth of utilities. The questionnaire revealed that only about $10,000,000 worth of new thermal cracking equipment would be wanted, and most of that appears to represent necessary replacements rather than expanded facilities for this branch of the art. The expectation is that at the war's end thermal cracking capacity will remain at about 125,000 b/d, or will probably decline because of obsolescene, while catalytic cracking capacity will expand to about 900,000 b/d. It thus appears quite certain that

Gas Turbine Installation in 100-Octane Gasoline Plant.



in the main, catalytic cracking will be the dominant process for the production of motor fuel because it is the richest source of "octanes" that can be used to upgrade low-octane products.

It is generally agreed that the postwar automobiles will run on gasoline with octane numbers ranging from the upper 70's to the lower 80's, and eventually into the 90's, in proportion as the engine designers succeed in overcoming preignition and other difficulties standing in the way of an increase of the compression ratio to near 10:1. Higher-octane fuel will be limited to military and long-range commercial aviation; the latter is expected to expand greatly when normal peace returns, though as consumers of fuel both military and commercial flying will remain relatively unimportant in comparison with the 34,000,000 road vehicles expected by 1950.

There is currently a good deal of speculation about how much gasoline will be required by post war private planes. Some enthusiasts visualize a four or five-seat plane in every back yard purchased at a cost not much more than would be paid for an average automobile. More conservative estimates take into consideration that before the war there were only 20,000 private plane owners in the United States, while inquiries were being received at the rate of 63,000 a year. Since the beginning of the war some 3,000,000 persons have been trained in various phases of aviation, and many of these will be more or less interested in flying. Some current estimates indicate that the post war private plane market will absorb from 15,000 to 60,000 units a year. The American Air Lines estimates that these private planes will absorb more than a billion gallons of gasoline a year (65,000 b/d). The C.A.A. says that in 1949 the public will own 200,000 private planes which will consume 43,900 b/d., of gasoline and that in 1954 the number of private planes will have increased to 400,000. Some experts who have studied the question think that few or none of the private planes will use 100-octane gasoline. Light and medium craft will get along on 80-octane; the regular aviation grade will be 91, with 92 or 93 for special use in commercial line of rations, leaving the 100-octane and higher grades for the military and for trans-ocean flying.

At the beginning of this article it was stated that as regards the petroleum business two things were certain: the more than three billion horse power in the internal combustion engines in the United States must continue to be supplied with petroleum products, and that the petroleum refiners can supply petroleum products to meet any specifications that may be put up to them. It was also hinted that present liquid fuel standards may be subject to much modification that in some respects may be of a drastic and revolutionary character. Just now, most emphasis is being placed on octane rating, but there are signs that anti-knock quality will become of diminishing importance. There appears to be still much room for expansion of the use of low-octane fuels for diesel engines, particularly in rail transportation. Coal-burning locomotives are fast losing ground to diesels. It is said that for every steam loco that is being ordered for main line service two orders are placed for diesels; for switching service the preference for diesels is 100 percent. As of November 30, 1944, the score was 39,740 steam locos to 2,389 diesels. The coal interests are naturally alarmed, and the railroads interested in coal are trying to stem the tide by intensive research on high pressure steam turbines. In this competition diesels can make long runs without refueling and they need little or no water. They do need the naphthas and gas oils that are also needed by the catalytic crackers, which puts something of a floor under the price that must be paid for their fuel. The prospects for auto-diesels are less clear, but experts have cited various reasons for expecting that high end-point fuels in compression ignition engines are getting in a position to offer serious competition to gasoline fuels in spark-ignition engines. In proportion as this trend advances the present importance of nigh-octane fuel for automobiles will diminish.

The value now placed on high octane number is also threatened with deflation by other developments that are just appearing on the horizon. It was mentioned above that the gasoline engine designers are struggling with the problem of reducing the compression ratio, and that as they approach the ratio 10:1 they encounter serious difficulties, such as pre-ignition. One way to combat this annoyance is to provide cooling; and strangely as it may sound, an efficient means of cooling is to inject water along with gasoline into the engine. The cooling effect here is due to the fact that the water evaporates in the cylinder and absorbs much heat, thus lowering what would be an excessive heat of combustion. The latest proposal is to use a mixture of alcohol and water instead of plain water, which gives a better effect. The most desirable result is obtained when the water-alcohol mixture is added to a gasoline which has an octane number that is 10 or 15 points lower than that of the gasoline on which the engine has been designed to run—that is, it becomes possible to greatly lower the octane quality of the fuel. At present the principal use of this device is to give a maximum burst of power to heavy aircraft at the moment of take-off, and in light aircraft that operate at full load only part of the time. It involves certain inconveniences when used on land vehicles, such as having to provide two fuel systems, but there are some who suspect that these inconveniences will not prevent the ultimate extension of the system into the field now occupied exclusively by straight gasoline fuels of high octane ratings. The possibility of scaling down octane requirements by 15 points is pretty sure to stimulate some inventive effort.

The present supremacy of high octane fuel for automobiles and airplanes is also being threatened by two other developments of even more radical character. The first of these is the gas turbine. In this turbine the power is supplied by simply burning nearly any kind of liquid fuel to produce combustion gas at a high temperature and a high pressure in such a way that the escaping gas is forced to turn a propeller or other power take-off. The gas turbine has been in development for some time and has found considerable use in petroleum refineries to recover waste power from hot gases coming from the regenerators of catalytic crackers. The mechanism is simple and has a smaller weight than comparable internal combustion engines of the common types. The Wright Aeronautical Corporation has announced its entry into the field of gas turbines for engines for aircraft and expects to build them up to 10,000 horse power. Speeds of 500 to 600 miles an hour and ceilings up to 40,000 feet are said to be attained. Already much effort is being made to use the gas turbine as a prime mover for stationary land engines, with an ultimate objective of extending it to automotive engines on the road. But the gas turbine still has some technical hurdles to overcome. It is not an efficient competitor with the modern high pressure steam boiler unless fuel is burned in it to produce a very high temperature; and the problem is to find metals or other materials that will withstand such great heat. So far, the temperature limit of 1200°F. has not yet been passed in existing models of the gas turbine, but there is some hope that a combination alloy of chromium, tungsten, and possibly other materials will allow the working temperature to go up to 1500°. In that case the competitive race between low-grade oil products and steam (coal) will be on in earnest.

A more recent and still more spectacular development is the jet propulsion engine, which is not an engine at all but a sort of rocket that is driven forward by the back pressure of very hot gas escaping under high pressure through a narrow opening; unlike the gas turbine the jet propulsion outfit does not drive a propeller or other power take off. It has demonstrated its practicability in military aviation where speeds of 800-miles an hour are said to have been obtained, and there is already talk of extending it to automobiles, family planes and other vehicles. In construction the jet engine is extremely light and simple; a 300-horse power jet weighs less than 150 pounds. It can use any flowable liquid fuel—paraffin, diesel fuel, or tar oil; it has no supercharger, gear shift, or clutch. Automotive engineers believe that in aircraft other than military the best application of jet propulsion will be in combination with a combustion-driven propeller. The Shell Oil Company's new power research laboratory is working along this line.

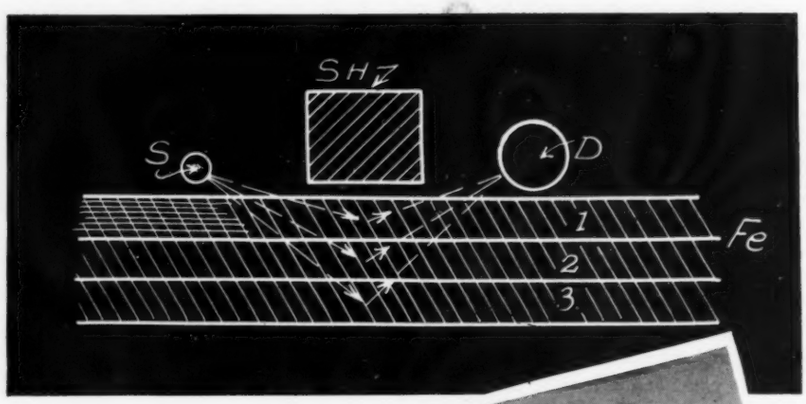
If these newer prospects come to pass on any large scale it is easy to predict that the oil industry will do much less thinking in terms of octanes and anti-knock; it will still have to find a lot of liquid fuel, but it will not have to be so particular about the quality of its products.

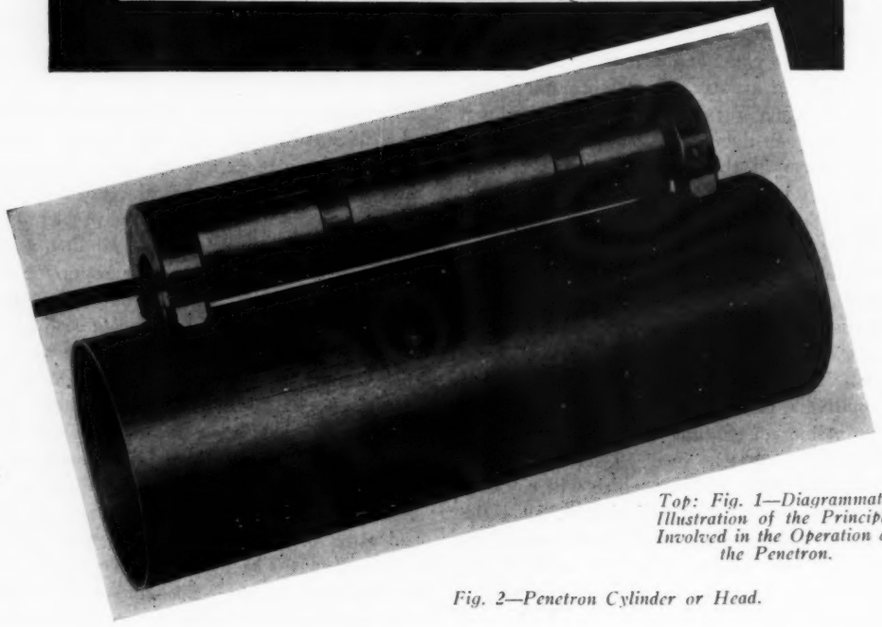
PENETRON USES RADIATION TO MEASURE METAL WALLS

New Device Has Many Applications Including Detection of Corrosion, Measurement and Control of Liquids and Determination of Density.

"PENETRON" is the name of a new gadget that fills a long felt want in the oil refining industry, and other industries which have been contending with the difficulties that the penetron was designed to surmount.

Much of an oil refinery's work is done by means of pipes, pressure vessels and tubes, such as the furnace tubes in which crude oil is heated to a high temperature in cracking, reforming and other oil-handling operations. Crude oil and other refinery products are often corrosive and the inner surfaces of the tubes and vessels are subject to corrosion which may seriously decrease their wall thickness. Most refinery operations are conducted at high pressure, and when a weakened tube gives way the results may be and often have been disastrous. For this reason refinery tubing that is subject to corrosion must be kept under inspection in order that replacements may be made in time. Heretofore such inspections have been carried out by boring holes in the wall of the pipe so that caliper measurement may be made of the metal thickness, after which the hole is plugged and welded tight. Or the pipe is dismounted and a caliper is poked into it to measure the inner diameter; the outer diameter is then measured and the wall thickness is calculated by the well-known formula O.D.+I.D/2. Both these methods are time consuming, expensive and do not always reflect the true situation. These interior measurements are often impossible to make on account of the inaccessibility or shape of certain parts of the equipment.





Top: Fig. 1—Diagrammatic Illustration of the Principle Involved in the Operation of the Penetron.

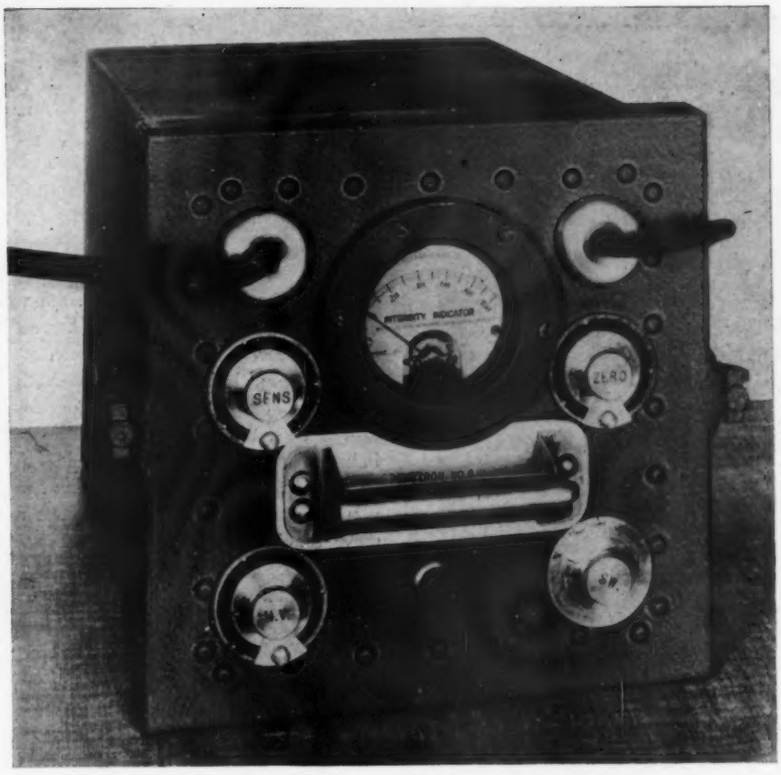
Fig. 2—Penetron Cylinder or Head.

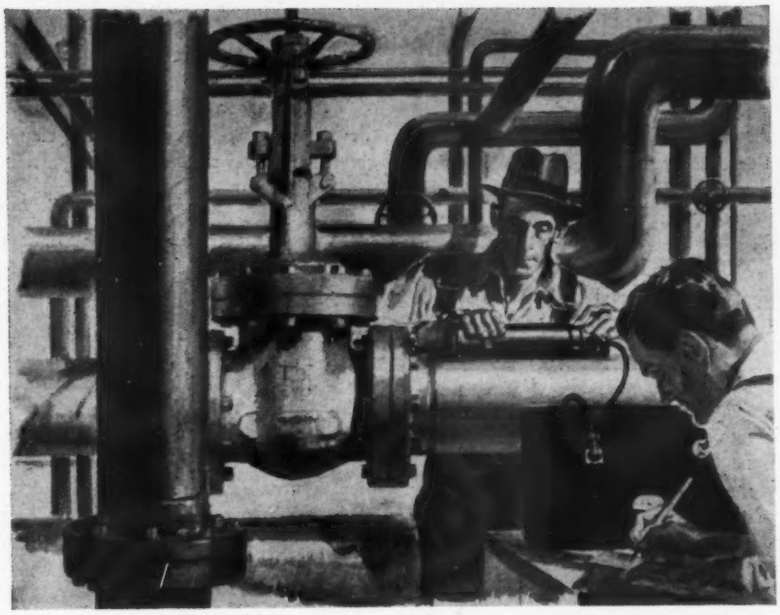
The penetron, developed by the Texaco Development Company, a subsidiary of The Texas Company, measures the wall thickness of a pipe from the outside, without having to look at the inside at all. It does this by employing a small bit of radium, which has the property of emitting gamma rays. The principle involved, reduced to its simplest terms, may be understood from the accompanying diagram of Fig. 1. In this diagram the shaded layers numbered 1, 2 and 3, represent adjacent layers of a homogeneous wall, the thickness of which is to be measured. Penetrating gamma rays emerge from a radioactive source S. These rays impinge on the wall and penetrate into it. A portion of the rays pass through the wall and emerge on the opposite side. These rays serve no useful purpose and are disregarded. Another portion of the radiation is scattered in all directions by the electrons of the atoms which make up the wall. Some of these scattered rays emerge on the same side of the wall from which they originally entered. It is this particular portion of the radiation, termed back-scattered radiation, which is utilized in the penetron for measuring wall thickness.

By measuring the intensity of the back-scattered radiation, as by means of detector D, it is possible to determine the thickness of the wall, since for a wall of any given composition, the intensity of the back-scattered radiation increases as a direct function of the wall thickness. In order that this measurement may be made with a high degree of accuracy, it is necessary to set up the source of radiation, the wall and the detector in accordance with a predetermined geometric arrangement. It should be noted that the block SH, shown in the drawing, is employed as a shield to prevent radiation from the radioactive source falling directly on the detector D.

The radiation picked up by the detector creates current discharges which are amplified and integrated to produce a direct current. The amount of current produced is measured by means of an indicating microammeter. The readings obtained on the microammeter, therefore, are directly indicative of the wall thickness.

This principle is put to use in the manner shown in Fig. 2; see also Fig. 3. Here is seen a section of pipe, on which rests a cylindrical case which contains the radium and the detector, and makes contact with the pipe wall by means of a point; projecting from the left-hand end of the cylinder is a wire about 75 feet long, which connects with the control box (Fig. 3)





Top: Fig. 3—Meter Box of the Penetron.

Above: Measuring Density and Thickness of Materials by Means of Reflected Gamma Rays.

that contains the measuring circuit and the power supply. As the cylinder containing the radium and detector slides along the length of the pipe the microammeter located on the face of the control box shows the wall thickness of the pipe at as many places as may be desired.

The penetron will measure iron or steel walls up to a thickness of about 3/4". The limit for other materials is different so the instrument has to be calibrated for the material on which it is to be used; calibration charts for iron, aluminum, lead, wood, and other common materials are furnished by Engineering Laboratories, Inc., which has the exclusive right to manufacture and distribute the penetron.

Because it can accurately measure back-scattered radiation the penetron can do a number of things which were not thought of when the investigation was started. For example, if the head of the penetron is moved down the wall of a tank partly filled with a liquid the reading of the instrument will remain constant until it reaches a point opposite the level of the liquid in the container. At this point the meter will indicate an increase in the amount of back-scattered radiation, due to the fact that the radiation passing through the wall is scattered not only by the wall but also by the liquid in the vessel. By noting the point on the wall of the vessel at which an increase in the reading of the instrument is obtained, it is possible to locate the level of the liquid quite accurately. Likewise, the interface between two fluids of different densities can be located easily and accurately from the outside of a container without actual access to the interior.

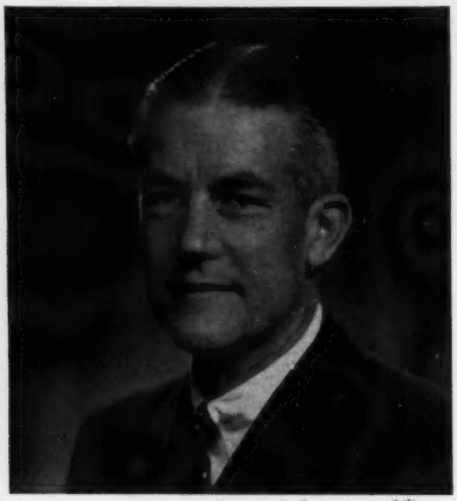
By proper instrumentation the penetron may be adapted to control as well as to locate liquid levels. In addition a continuous record of the location of the levels may be obtained by employing a recording device. The following are a few specific examples of some of the types of liquid level measurements which may be made with the penetron: gauging liquids in storage tanks; gauging liquified gases in cylinders; controlling levels in process units, such as the solvent-oil interface in a solvent refining tower; determining and controlling the catalyst level in catalyzed chemical reactions.

Since the total number of electrons present in a unit volume of any substance is closely related to the density of that substance, it is apparent that the amount of scattering per unit volume is largely dependent upon the density of the material. Therefore, as the density of the material increases the amount of back-scattered radiation detected by the penetron also increases and for practical purposes the penetron measures density. For this reason, the density of a fluid inside of a container may be determined directly without actual access to the fluid itself. In actual experimental work employing a penetron situated on the outer wall of a container having a wall thickness of 0.3 inches, it was found possible to check the specific gravities of fluids having values of between 10° Baume and 75° Baume with a high degree of accuracy, values obtained by the penetron checking very closely with gravities obtained on the fluids by conventional methods. This is a great convenience in determining the specific gravity of liquids in tankage, routing the flow of oil in pipe lines, controlling blending operations in which two materials of different densities are mixed, and determination and control of proportions of reactants in chemical processes.

In addition numerous other applications are possible, particularly wherever it is desired to determine the density of a substance without the necessity of sampling or without actual access to the material.

Oil Company Staff Changes

W. F. Moore



David Allan Shepard

W. F. MOORE has been appointed general manager of foregin operations for The Texas Company. A native of Georgia, Mr. Moore completes has twenty-fifth anniversary with The Texas Company this year. In 1920, after leaving the U. S. Navy, he entered the employ of the company at the Port Arthur, Texas, refinery in the power department. He remained with the refining department in various engineering capacities until 1930, except for intervals of special assignments in other fields of the company's activities. From 1930 to 1938 he represented the company in several official capacities in both the domestic and foreign fields with affiliated patent and research interests. He returned to the Texas Company in 1938 and served as chief purchasing officer until 1943 when he was assigned to Foreign Operations as assistant to the vice president, acting in an administrative capacity.

DAVID ALLAN SHEPARD has been elected chairman of Anglo-American Oil Co., Ltd., British subsidiary of Standard Oil Company (N. J.). He succeeds E. E. Soubry who is now stationed at the New York headquarters of Standard in charge of all export marketing activities. New members of the Anglo-American board, in addition to Mr. Shepard, are Robert Halstead Porters and William Ernest Jenkins.

During 1942-1943 Mr. Shepard was petroleum attache for the State Department at the U. S. Embassy in London, and subsequently was appointed a representative of the Jersey Standard in the United Kingdom. He joined Standard in 1927 as a research engineer and was engaged from then until 1942 in connection with oil hydrogenation, product-specifications and product-application problems.

Mr. Porters joined the Standard group in June 1936 and was elected a member of the Council of the International Association (Petroleum Industry), Ltd., in 1942. He is financial adviser to the Standard for the whole of Europe.

Mr. Jenkins is known for his work with the Petroleum Board as Controller of its Finance and Accounts Division. He joined the company in 1920 as a traveling auditor and became its secretary in 1933.

R. A. Carder, who was appointed to the board in 1933, is managing director of the company. The other directors are: A. Waterston, J. L. N. Pollock and L. Sinclair.

TWO field engineers have just accepted assignments with the Pennsylvania Grade Crude Oil Association's production research laboratory at Bradford, virtually rounding out the staff, according to Dr. Richard V. Hughes, director of production research. They are Quay D. Ellenberger of Pittsburgh and David L. Evans of Bradford.

The field men will assist Dr. R. J. Pfister, laboratory director, in work with a water profile measuring device. Designed and built by Dr. Pfister, the instrument was devised to determine the water input rate of a water input well, sand by sand. The device works on the principle of following a fresh water-brine interface in the well bore.

Following preliminary tests with the new equipment, the research head said, the laboratory will conduct experiments to determine the effectiveness of selective plugging agents and actual results obtained by current well-shooting practices.

AS part of the preparations of Standard Oil Company (Indiana) for post-war activities, a regrouping of its research and development staff has been announced by Bruce K. Brown, vice president. The changes follow on Mr. Brown's recent re-election as a director and elevation to a vice presidency and on the promotion of Joseph K. Roberts to the position of general manager of research.

In order to co-ordinate the research work more closely with that of other departments, two associate research directors have been moved from the Whiting, Ind., laboratories to the general office in Chicago. While continuing his technical assignments, D. P. Barnard will also undertake liaison with the sales department. At present he is in Europe on an investigation sponsored by the Army Air Force. J. H. Forrester will also move to Chicago as general supervisor of technical service and product inspection activities for all refineries.

At the Whiting laboratories M. T. Carpenter has been appointed to the new position of executive director. A graduate of the University of Kentucky, he has been with the company for fifteen years and had been an associate director of research since 1938. R. C. Gunness has been raised from the rank of assistant director to that of associate director. Dr. Gunness received his doctor's degree from Massachusetts Institute of Technology in 1936, and spent two years on the faculty as a director in the school of engineering practice before joining Indiana's research staff.

R. N. Giles, also an assistant director, has been promoted to the new position of superintendent of the technical service division. After graduate work at Ohio State in 1930, Dr. Giles spent four years at the company's Casper, Wyoming, refinery and was then moved to the research staff at Whiting. A. B. Brown has become assistant superintendent in charge of technical service on heavy oils. He has been with Indiana Standard since gaining his Ph. D at Johns Hopkins. C. R. Harte has been made assistant superintendent in charge of the work on light oils technical service and will also continue to supervise economic studies. After graduate work at Michigan and several years of subsequent experience in industry Dr. Harte joined the Indiana staff in 1936.

GORDON A. KESSLER. patent attorney, has been named to head the patent division of Houdry Process Corporation. Mr. Kessler holds a degree in Industrial Chemistry from the University of Maryland and an LLB from New York University and is a member of the New York bar. He joins Houdry after being employed as patent attorney with the Texas Company for several years. Prior to joining The Texas Company, he was patent attorney for Allied Chemical and Dye Corporation and was an examiner in the U. S. Patent Office.

THE appointment of John F. Bricker to the position of Chief Scout left vacant by the recent death of Dell J. Crosby has been announced by the management of Humble Oil & Refining Company. Mr. Bricker has been connected with the geological department of the Humble Company since his employment in 1928.

A native of Cherryvale, Kansas, Mr. Bricker came to Cisco, Texas, in his early youth. His father, A. J. Bricker, was in the employ of Humble Pipe Line Company, and John has spent his entire business career with the Humble Company. From instrumentman at Cisco in 1928, he became scout in the Cisco area, and later, in 1934, he was made scout in the Pampa area. He came to the Houston office as a title man, and was doing land work at the time of his appointment.

SEVERAL changes in directorate and officers of International Petroleum Co. Ltd. were made at the annual general meeting of shareholders and subsequent meeting of directors on June 27. R. V. LeSueur, president, continues in that office and also becomes chairman of the board, succeeding G. Harrison Smith who has retired. Retirement of J. R. Clarke after twenty-eight years as secretary was also announced. G. H. Mullinger was appointed secretary and assistant treasurer and E. F. Howard comptroller, treasurer and assistant secretary. F. B. Bimel was re-elected vice president. Other directors in addition to Mr. LeSueur and Mr. Bimel are: B. A. Myers, C. S. Wilcox, E. E. Soubry, L. F. McCollum, O. C. Wheeler, J. R. White and P. W. Lambright. The four last named are new members of the board.

E. L. DAVIS has joined the Signal Oil and Gas Company to serve as general production superintendent, reporting to Walter Greenfield, manager of the oil producing department. Mr. Davis is a graduate of Stanford University, with a degree in geology, and has been in the oil business since 1923. He joined the Chanslor-Canfield Midway Oil Company as petroleum engineer and later was with the Miley Oil Company. From 1926 until 1941 he was with The Texas Company in California and was serving as district engineer for that Company in Long Beach when he joined the Production Division, District V, of the Office of Petroleum Administration for War. He was appointed assistant director of the production division in May, 1943 and a year later became director of production, filling that post until his recent resignation.

FLOYD PRATT, formerly assistant manager of gasoline sales, is the newly appointed district sales manager for Tide Water Associated Oil Company in the Territory of Hawaii, according to an announcement released by W. A. Reanier, sales manager for the company. Pratt's background is one of opening up and developing new territories and his transfer to Hawaii is being made, according to Mr. Reanier, for the purpose of increasing Associated's Hawaiian distribution. In the new set-up, Ford King becomes manager of operations of the entire Hawaiian district.

J. TAYLOR FLY, recently elected director of Creole Petroleum, Venezuelan affiliate of Standard Oil Company (New Jersey) has been associated with Latin-American petroleum and legal affairs since 1920. Prior to joining Creole in 1942, he was a member of Jersey Standard's Latin-American legal staff from 1935.

Born in Goliad, Texas, Mr. Fly received his degree from the University of Texas in 1913 and engaged in private practice in San Antonio for several years. Following service in World War I as a second lieutenant with the U. S. Transport Corps he went to Tampico, Mexico as head of the legal department of the Continental-Mexican Petroleum Company in 1920. In 1927 he joined the law firm of Schuster & Feuille, specializing in Latin-American law. After eight years, in which much of his time was spent in Caracas, Venezuela, he joined the Standard Oil Company of Argentina at Buenos Aires, where he remained until coming to New York in 1942. He was elected to the Creole board at the 1945 annual meeting. He is a member of the Venezuelan Chamber of Commerce, the Bolivarian Society, and the Pan-American Society.

COL. BERNARD F. JOHNSON has been released by the U. S. Army Air Force and has returned to the California Texas Oil Company, Limited, to head the Aviation Division with headquarters in New York.

In his capacity as Petroleum Products Supply Officer, Army Air Force Command, in the European-African theater of operations, Col. Johnson was responsible for the procurement and distribution of all petroleum products required for Allied Air Force combat operations. For this he was awarded the Legion of Merit by Lieutenant General Carl Spaatz at the direction of General of the Army Dwight D. Eisenhower.

The operational use of super-grade aviation fuel in fighter aircraft materially increased the performance of these aircraft, Colonel Johnson and his staff were cited by the Commanding General of the Eighth Air Force, for their indefatigable efforts to further the initial test flights, accelerate operational service flights and the operational supply of supergrade aviation fuel. He supervised the testing and experimentation of petroleum products to increase the efficiency of Allied combat planes.

Colonel Johnson has an aeronautical rating as a pilot of twin-engine Army aircraft. He attended Texas A & M, Columbia University and Shanghai University, and specialized in chemical engineering. He was a member of the executive Committee of the British War Cabinet Oil Control Board.

For many years before the war, Colonel Johnson was in the Far East for California Texas Oil Company and travelled widely in China, Japan, the Philippines and Indo-China. He has been decorated by the French Government with the Croix de Reinee and Indo-Chine T.O.E.

(*Continued on page 82*)

E. L. Davis

J. Taylor Fly

Col. Bernard F. Johnson

★ ★ ECHOES FROM THE WASHINGTON OIL FRONT ★ ★

By W. J. Maddox, *Chief of World Petroleum Washington Bureau*

Wants More Elk Hills Oil

Capt. W. G. Greenman

CAPTAIN W. G. Greenman, USN, Director of Naval Petroleum Reserves, is preparing to ask Congress' permission later this year to raise the production ceiling at Elk Hills above the 65,000 barrels a day now authorized. Output for several months has been hovering about the maximum allowable, having hit 65,000 for a short time but with the average approximately 64,000 because of repressuring work and operating conditions.

Some additional drilling is continuing under the Navy's agreement with California Standard for joint operation of the reserve to assure an even flow of crude without forcing individual wells beyond their most efficient production and to prevent any possible injury to the reservoir as a whole. Petroleum Administration for War is understood to have indicated to Navy that more oil from the reserve is desirable because of the increasing military requirements in the Pacific. Navy, in turn, must ask Congress for permission to raise the "take" above the present authorization.

Crude Oil Scarcity Foreseen

CRUDE oil is among the list of items that the newly appointed Joint Committee for Critical Material and Products of the War Production Board believes "are now or are expected to be in short supply." In its report the commitee says that the items on its list are those that "might bottleneck war-supporting programs or civilian programs of high urgency." The committee's work generally is limited to aiding industries engaged in producing urgently needed materials in procuring equipment. Expectation is that we shall be more than 200,000 barrels a day short of requirements this year.

Pacific War Needs

IN the about-face now taking place in the transportation of oil as a result of the clean-up in Europe and the centering of attention on Japan, emphasis is on water movement to relieve congestion on the already overcrowded rail lines. An increasing number of tankers is being allotted to Gulf Coast oil ports as fast as they can be transferred from the Atlantic and other services.

Contrary to the general belief, total military petroleum requirements when operations in the Pacific hit their peak will be greater than the quantity needed for both the European and the Pacific theaters before V-E Day. Transportation of oil to the Pacific area on a larger scale presents new and difficult problems. Because of the greater distances involved, it takes almost twice as many tankers to deliver oil from the Gulf Coast as were required to deliver the same amount to Europe.

Latin American Imports

PAW has at last broken its silence on foreign oil imports into this country, a censorship imposed because of German submarine activities. Its initial disclosure was the amount of crude delivered by tankers from Latin America to East Coast ports during the six weeks ending June 23 —more than 9,685,000 barrels which was 28 per cent of all crude received during that period in the East Coast area. During the corresponding weeks in 1944, imports of crude from Latin America were approximately 5,366,000 barrels and represented less than 18 per cent of the crude received in the eastern seaboard region. The rise in the quantity of Latin American oil coming in during the year is attributed to a temporary increase in the availability of tankers and the boost in crude production in Venezuela. The average number of barrels per day imported during the week ending June 23 was 162,000 as compared with 120,000 for a like period in 1944.

Oil Men Back Ickes

Harold L. Ickes

PRESIDENT TRUMAN'S statement that Petroleum Administrator Ickes was scheduled to make a trip to London during August to discuss the Anglo-American oil agreement with British officials revived speculation in Washington as to the chances of Mr. Ickes retaining his post in the Truman Cabinet. In some quarters the opinion was expressed that this might be a diplomatic way of easing him out of the job which he has held longer than any previous incumbent. Oil men who were not exactly friendly to Ickes at the time of his appointment to head the wartime Petroleum Adm'nistraion are now almost unanimous in seeking his retention until the war in the Pacific is ended. At any rate his designation for the London trip, in which he probably will be accompanied by Deputy Administrator Davies and Charles Rayner of the State Department, indicates that no early change in his status is likely.

Trade Act May Hit Oil

James F. Byrnes

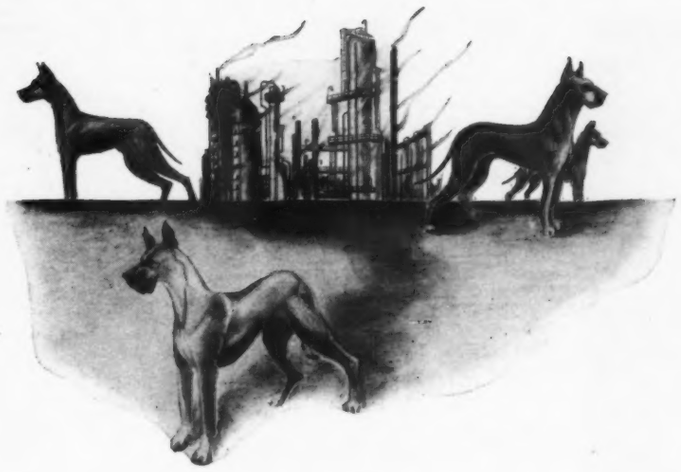
SECRETARY of State Byrnes takes up his duties with wider powers to negotiate reciprocal trade agreements than either of his predecessors enjoyed. At about the time of his appointment, Congress passed the bill extending the President's authority to adjust tariffs by trade agreements for another three years, and in addition permitted a further reduction in imposts of fifty per cent of the rates of duty existing on January 1, 1945.

The normal duty on foreign crude is 21 cents a barrel. The Venezuelan agreement cut this to 10½ cents, and if Mr. Byrnes sees fit he can now make an agreement with some country by which this could be further reduced 50 per cent, making the duty to all favored nations 5¼ cents a barrel.

Until the argreement was signed with Mexico in 1943, foreign oil could be imported into this country only up to 5 per cent of refinery runs during the previous year. However, the Mexican pact wiped out the quota and each new concession in any one agreement automatically applies to others that have been previously executed.

Kirkpatrick Transferred

MARK KIRKPATRICK, who has been transportation analyst for PAW since February last following his release from the Army, has been appointed Assistant Director of the Supply and Transportation Division of the District II office with headquarters in Chicago. Mr. Kirkpatrick, who is on leave from Pure Oil Company, succeeds John A. Turner who is reentering private business. Mr. Turner has been with PAW since May, 1942, first in the Washington office and then in Chicago.



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Foreign Oil Legion

Leland V. Stanford

ORGANIZATION of a new company in the international field was made known early in July when formation of the Tri-Pet Corporation was announced. The company is jointly owned by Sinclair Oil Company, Cities Service Company of Pennsylvania and Richfield Oil Company of California. Its immediate objective is crude oil production outside the United States.

Officers of the company are Leland V. Stanford, president; R. V. Whetsel, vice president; M. L. Gosney, treasurer, and J. Von Bevern, secretary. Directors are Leland Stanford and H . L. Phillips of Sinclair, Burl S. Watson and R. V. Whetsel of Cities Service and Charles S. Jones of Richfield.

A subsidiary company has been organized to conduct operations in Columbia with headquarters in Bogota. It is designated as Companias Unidas de Petroleo. W. H. Donahue is general manager and director. Additional directors are W. P. Wilson and Eduardo Lopez. The company has filed applications with the Colombian government for concessions covering 750,000 acres of national lands and may acquire additional acreage through leases of privately owned lands.

AL GREGERSON, until recently a member of the PAW staff, District V, in charge of the Reserves Section, has joined up with the Danish American Prospecting Company and will be located in Copenhagen, Denmark. This company is a subsidiary of Gulf Oil Corporation and is operating under a concession obtained by Gulf prior to the outbreak of war in Europe. Some exploratory drilling was done before the occupation of Denmark by the Germans forced the suspension of operations. These activities are now to be resumed.

ON June 6 oil started moving from the Casabe field in Colombia through a pipe line ten kilometers long which connects with the Andian National line and conveys it to tidewater whence it will move to world markets. Casabe is located on the Yondo concession developed by Shell Oil Co. of Colombia and at present has thirty wells in production with an output of about 8,000 barrels daily. It is the third Colombian field to reach the stage of commercial production. It brings Colombia's production up to or above 63,000 barrels per day.

The establishment of the pipe line connection was made the occasion of an official ceremony being attended by President Alfonso Lopez, Minister of Petroleum J. A. Guzman and a large group of other Colombian officials as well as by officers of the Shell Company. The event was hailed as marking the commencement of a new era in Colombian oil development.

Starting Flow of Oil from Casabe Field — Left to Right: President Alfonso Lopez; Dr. Gutierrez; H. M. Burns, Manager of Shell of Colombia; Auditor Carlos Guzman and General Piedrahita. (Photo by Dykstra)

R. M. Dinges

RAWLSTON M. DINGES has become vice president of Continental Supply Company in charge of exports, following the retirement of Fred L. Convers from that position. Charles J. DeLay becomes manager of the exports division. All three men are widely known members of the oil fraternity. Fred Convers has roamed export fields ever since he emerged from the oil country of Western Pennsylvania where his early years were spent. He joined Continental twenty-five years ago, is a veteran member of the group of export representatives who have their headquarters in New York and is a charter member of the New York Chapter of Nomads.

F. L. Convers

C. J. DeLay

Dinges has been with Continental since 1923. In 1927 he was sent to Venezuela to install an engine and has been in export ever since. He is an active figure in the Nomads and is secretary of the New York chapter. Charley DeLay likewise has been widening his circle of friends for many years along with the growth of Continental's business having joined the New York office in 1921. He too is an active and enthusiastic Nomad.

S. RILEY WILLIAMS has been appointed director of international business for Worthington Pump and Machinery Corporation. In this newly created position he will have administrative charge of the company's export activities and will supervise the operations of associated companies abroad.

D. B. KEMBALL-COOK, until recently in the exploration division of Shell Company in Texas has been transferred to the Caribbean Petroleum Company, Shell group subsidiary in Venezuela.

ING. AMADO CHAPA has been appointed Mexican representative of the engineering organization of Edward L. Carter of New York. Mr. Chapa was born in Linares, Nuevo Leon, Mexico, received his early education there and in San Antonio, Texas, and later attended the Colorado School of Mines, graduating with the degree of Mining Engineer. After an association for several years with mining enterprises in Mexico, he established an export-import organization to promote trade between Mexico and the United States. Among the companies that Mr. Chapa will represent in Mexico in behalf of E. L. Carter and D. T. O'Connor are the Shaffer Tool Works, W. C. Norris, Frank Wheatley, Tulsa Boiler and Machinery Co. and Ben F. Kelley C

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(*Continued from page 56*)
ing from 8 to 20 milli D'Arcys. The virgin pressure in the "A" sand was approximately 3927 pounds per square inch and was near the dew point; other sands in the field have pressures as high as 5224 pounds per square inch.

As a result of the above hearing and the voluminous testimony presented, the Commission found that waste of the natural resources in the Lake Creek Field is reasonably imminent; that such waste can be expected and will occur and that it can be prevented. To prevent waste, the Commission issued the following order:

WHEREAS, After notice given for the time and in the manner required by law, the Railroad Commission has heretofore and from time to time held many hearings with reference to the Lake Creek Field, Montgomery County, Texas, which hearings include the hearing held in Austin, Texas, beginning on March 24, 1944, and ending on March 27, 1944, at which said hearings much evidence has been adduced and much testimony placed into the record as to the physical characteristics of and producing conditions in the various oil and gas producing reservoirs in said field, and

WHEREAS, As a result of said hearings and based upon the evidence adduced thereat, the Commission has heretofore promulgated special rules to govern the drilling, production, and operation of wells completed in the various sand reservoirs in said field; has recognized by these special rules, and the various amendments made thereto, the separateness of various sand members from which production of oil and gas is had in the field, and has determined from the evidence submitted that some of these sands are common to and have been penetrated by most of the wells drilled in and field and are, therefore, more or less blanket sands in the area as distinguished from other sand members that appear to contribute to production over relatively small areas, and

WHEREAS, The Commission has heretofore found and does at this time find that the "A", "B" and "D" sand reservoirs in the Lake Creek Field, as said reservoirs are identified in its field rules for the field, are of such extent as that they may be termed blanket sands; that due to the geographical spread of these sands it can be reasonably expected that they will be penetrated and will be productive in wells that are drilled in accordance with the Commission's adopted spacing rule for the field so long as such wells be within the producing confines of the Lake Creek structure; and that said sands are therefore adaptable to the inauguration of a pressure maintenance program, and

WHEREAS, The Commission further finds as facts:

(1) That the Lake Creek field produces sweet gas from some of the separate sand reservoirs and sweet gas and crude oil from other of the separate sand reservoirs located therein.

(2) That some of such reservoirs in said field contain gas which is extremely rich with hydrocarbons, which hydrocarbons drop out and assume a liquid phase in the reservoir when the pressure therein is reduced below critical values.

(3) That the hydrocarbon content of the gas produced from the various separate reservoirs in the Lake Creek field varies as between reservoirs, and that the "A", "B", and "D" sand rehydrocarbons per unit volume of gas than does the gas produced from other reservoirs in said field.

(4) That the hydrocarbons contained in the reservoirs of the Lake Creek field are natural resources which can be conserved and their waste prevented if the reservoir pressure is maintained.

(5) That it is necessary to maintain the pressure in the "A", "B" and "D" sand reservoirs in the Lake Creek field; that due to the productive extent of these reservoirs it is feasible and practical to maintain the pressures therein, and that the maintenance of pressures in said reservoirs is necessary to prevent actual physical waste of natural resources, and to obtain the greatest ultimate recovery of these resources to the end that the minimum of liquid hydrocarbons will be left in said reservoirs never to be recovered, and

WHEREAS, Based upon the factual findings of the Commission, which findings are substantiated by the preponderance of evidence adduced pursuant to all of said hearings heretofore referred to, the Commission further finds that waste of natural resources, as such is defined in the applicable statutes of this State, is occuring or is reasonably imminent in said field, and that the present rules and regulations of the Commission applying thereto are insufficient and inadequate to prevent the occurrence of said waste, and

WHEREAS, Pursuant to the dominant and controlling mandate to the Commission to prevent the waste of natural resources in this State, the Commission finds that additional rules and regulations to apply to the Lake Creek field are necessary, and that the same should be adopted and enacted to the end that preventable waste which is occurring therein or which is reasonably imminent, and which the Commission finds is indisputably preventable, may be obviated.

NOW, THEREFORE, IT IS ORDERED By the Railroad Commission of Texas that the reservoir pressures in the "A", "B", and "D" sand reservoirs in the Lake Creek field in Montgomery County, Texas, as said reservoirs are defined and classified in the Commission's field rules applying to said field, and which said field rules are hereby referred to and incorporated herein for the identities to said reservoirs, be maintained at such a point as will insure the efficient recovery of the natural resources constituted of the hydrocarbons contained therein to the end that preventable waste of said natural resources shall be prevented and the ultimate recovery thereof increased.

IT IS FURTHER ORDERED By the Commission that, insofar as any conflict between this special order and other orders either special or general applicable to the Lake Creek field, this special order shall be dominant and shall be given controlling effect.

IT IS FURTHER ORDERED By the Commission that the provisions of this order shall become operative and effective as of July 17, 1944.

IT IS FURTHER ORDERED By the Commission that this cause be and the same is held open on the docket in order to permit and for the purpose of permitting any affected party to present to the Commission, after due notice and hearing, any matter pertaining to the application of the provisions of the order here entered in this cause, and for the further purpose of enabling such party to seek through the Commission such relief as he deems he is entitled to in the premises.

The foregoing order was signed by Chairman Jester and Commissioner Thompson. At the same time the following memorandum was addressed to them by Commissioner Culberson:

With reference to the hearing held on the Lake Creek field of Montgomery County for the purpose of determining whether or not pressure maintenance in various gas producing reservoirs in said field would be required by the Commission, I want to go on record as concurring in the proposed findings with reference to this field, but I cannot convince myself that the Commission has the statutory or legal authority to take this very constructive and forward step, which looks to the utilization of the greatest possible volume of the component elements recoverable from natural gas.

To my mind Sub-paragraph C, Article 6014, which article defines waste, is an indication by the Legislature that the very thing we would attempt to do under the proposed order should not be done by the Commission. I grant that Sub-paragraph H gives some grounds for the contention made in the very able and persuasive brief filed by Mr. Patman, but I am firmly convinced that the statutes covering this entire matter indicate the the Legislature only had in mind the prevention of waste by "volume". This, I think, applies with equal if not greater force to gas than to oil.

With the great progress that has been made in the technique of gas engineering and refining, there is no doubt in my mind whatever but that there should be specific legislation, in unmistakable language, that would bring about the very thing that Superior Oil Company is now seeking to have the Commission by its order to do.

However, much I concur in the intention and desire to process the greatest ultimate recovery of the component elements of natural gas, I do not believe, as stated above, that the Railroad Commission is vested with authority under the present statutes to cause this to be done or to enter an order that would attempt to cause this highly desirable result to be accomplished.

The estimates of gas and oil reserves are rather questionable due to the structural conditions. However, the original gas reserves in place are estimated to be 450,000,000,000 cubic feet and the hydrocarbon liquid in the wet gas originally in the reservoir is estimated to be 58,000,000 barrels.

Due to high hydrocarbon liquid content of the gas, the maximum ultimate recovery of liquid hydrocarbon is dependent upon the maintenance of a relatively high and constant pressure.

The Commission's orders for the field prevent waste; gas is conserved, so that the maximum production of liquid hydrocarbons may be had.

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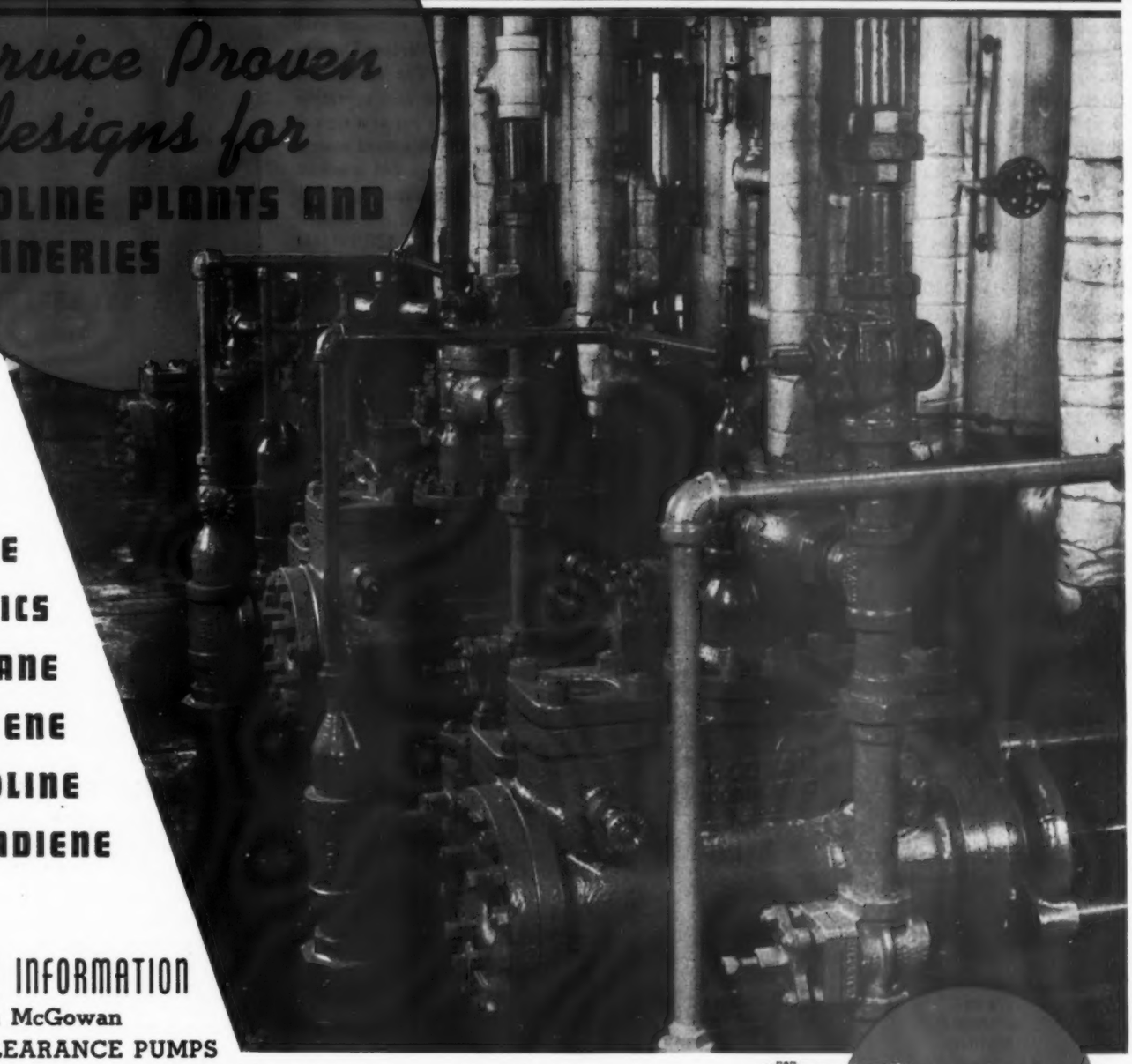

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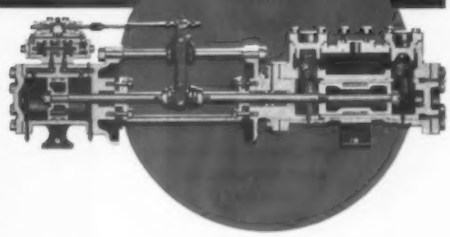
- 600 lbs. discharge pressure — in cast iron.
- Welded steel valve gear bronze bushed with covered oilers.
- Piston type main steam valve with by-pass arrangement for throttling.
- Two-piece rods on all sides.



- Many interchangeable parts in different sizes for easy maintenance.
- Minimum spares necessary.

IMMEDIATE DELIVERY

WRITE FOR CATALOG 200

Branch Offices

Boston	HANcock 3995	Tulsa	5-2151
New York	MUrryhil 2-7195	Cleveland	CH. 6776
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Houston	FAirlax 8089	Charleston, W. Va.	37-606
Los Angeles	VAndk. 1359	Salt Lake City	3-4682
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Seattle	CApital 7670	Chicago	CAlumet 2211

McGOWAN PUMPS

LEYMAN MANUFACTURING CORP.
McGOWAN PUMP DIVISION
59 CENTRAL AVE. CINCINNATI 2, OHIO

U. S. Engineer Aided "Operation Pluto"

NOT only were American manufacturers called upon to supply materials for the pipe lines that transported oil underneath the English Channel during the Allied invasion of the Continent as described in the July number of WORLD PETROLEUM but Americans had a share in the development of the equipment used. Dr. Lester M. Goldsmith, chief engineer of Atlantic Refining Company was called upon for advice during the preliminary work on "Operation Pluto" as it was designated by the British.

When the plans had been proved practical the manufacturing facilities in England were supplemented by additional production in the United States. Dr. Goldsmith was made available to the Petroleum Warfare Department and all resources of Atlantic were put back of the work. Col. A. K. Eaton, of the United States Corps of Engineers, worked with the American civilian representatives.

According to Col. H. R. Lynn, technical and military adviser to the British Warfare Department in the United States: "The smoothness with which the project was put into operation and carried to completion stands out as a typical example of the co-operation which existed among the Allies and will probably be regarded as one of the most outstanding feats of engineering of all time when one stops to realize that the finished job enabled the lines to deliver 120,000,000 gallons of gasoline and fuel oil across Great Britain from Liverpool to the Channel, under the Channel to France, and thence across France to Germany to the fighting forces."

J. B. Taylor

McCarty Opens Houston Office

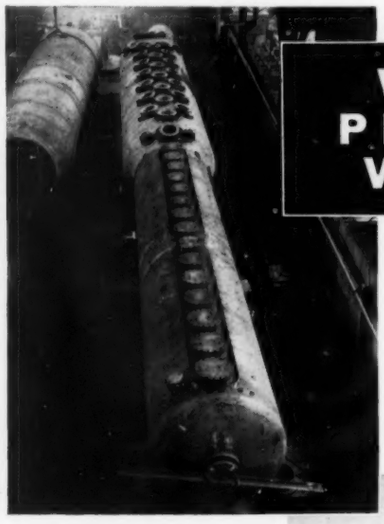
IN view of the anticipated increase of post-war activity in the oil industry, the McCarty Company, advertising Counsellors, have opened an office in Dallas, Texas. This is in addition to the offices maintained by the company in Los Angeles, San Francisco and Pittsburgh. J. B. Taylor, who has been active in the Sales and Advertising field in the southwest for the past fifteen years since his graduation from Cornell University, will be in charge of the office. For the past year he has served in an administrative capacity at the Radio Research Laboratory of Harvard University.

Sterrett Joins Corrosion Engineers

ELTON STERRETT has been appointed Executive Secretary of the National Association of Corrosion Engineers, with headquarters in Houston, Texas. For the past five years Sterrett has been on the editorial staff of the Oil Weekly and for nine years prior to that was assistant chief engineer for the Arkansas Pipeline Corporation at Longview, Texas.

Continental's War Production

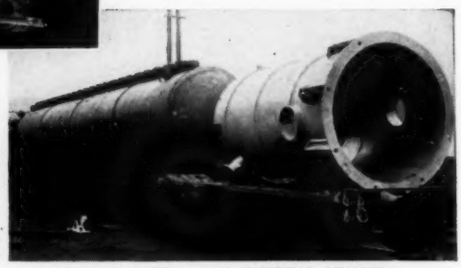
CONTINENTAL OIL COMPANY was complimented by Gen. H. H. Arnold and Deputy Petroleum Administrator Ralph K. Davies, in telegrams made public on July 13, on the production of more than 2,000,000 bbl. of 100 octane gasoline during the past year and 10,000,000 bbl. of all petroleum products for military use since Pearl Harbor. Both messages were directed to Dr. Walter Miller, vice president in charge of manufacturing who said that the 10,000,000-bbl. figure of war production included more than 300,000 bbl. of toluene for TNT and a blend of aviation fuel and nearly 750,000 bbl. of lubricating oils, substantially all of which was aircraft engine oil.



WELDED PRESSURE VESSELS

HYDROGEN PLANTS
as applied to
CRACKING OF PETROLEUM
HYDROGENATION
OIL SYNTHESIS

5'-0" & 6'-0" DIA. x 72'-0" TOTAL LENGTH



5'-0" & 6'-6" DIA. x 90'-6" TOTAL LENGTH

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X-RAY APPARATUS
AND
MODERN TESTING LABORATORY

DISTILLATION PLANTS
FRACTIONATING COLUMNS
HEAT EXCHANGERS
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VACUUM TOWERS
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and associate company
THE POWER-GAS CORPORATION LTD.
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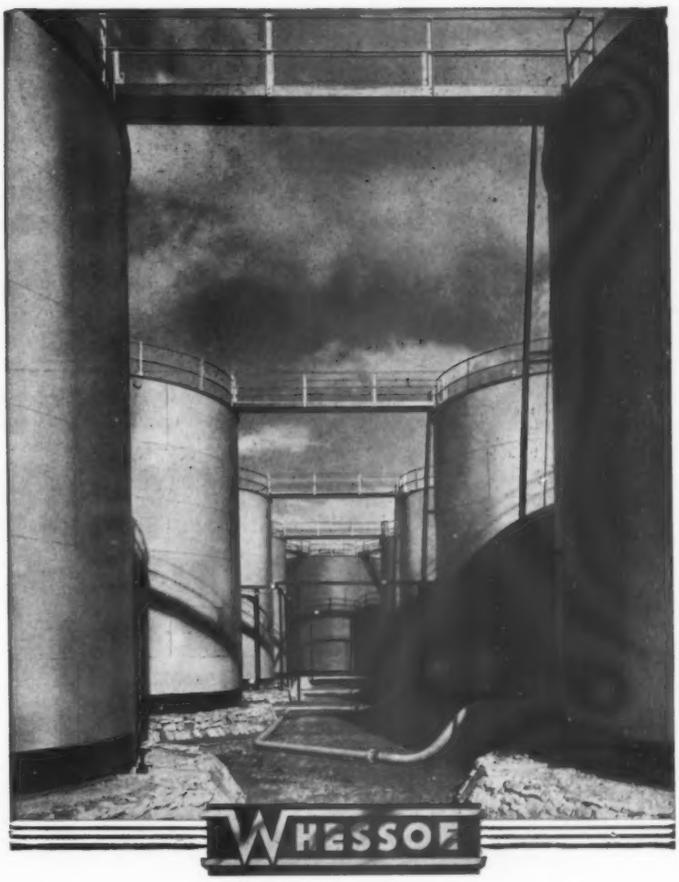
Whessoe

Service to the Petroleum Industry

Tanks and pressure vessels are designed, fabricated and quickly erected by the Whessoe Company's organisation which has been built up to meet the needs of the Petroleum Industry.



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WEIR

HEAT EXCHANGE EQUIPMENT

Heat Exchangers for all duties. Crude-to-Residue Exchangers, Side Stream Exchangers, Oil Coolers, etc. Vapour Condensers for vacuum, topping or cracking plants. Final Condensers (water circulated) and Partial Condenser (circulated with incoming crude). Weir Refinery Equipment includes Oil Pumps for all duties, Steam Ejectors for Vacuum Stills, and all auxiliaries for Feed pumping and Feed heating. Write for Catalogue Section 8 "Weir Pumps for the Oil Industry" and Publication No. 38 "Weir Power Plant Auxiliaries."

G. & J. WEIR LTD
CATHCART : GLASGOW

Second Producer in Florida

SUNNILAND NO. 4, the third well to be drilled by Humble Oil and Refining Co. in Florida, was put on the pump in the last week of June and produced 327 bbl. of oil and 168 of salt water in a 24-hour test. This is a better showing than that of the first well drilled which yielded 75 bbl. per day at the outset and is now down to about 20 bbl. The large proportion of salt water in No. 4 is considered to give it an uncertain future.

Oil Company Buyers

JOHN A. WHITELY, manager of purchases of Pan American Petroleum and Export Company, has been elected chairman of the oil company buyers of the Purchasing Agents Association of New York. He succeeds W. H. Bratches of Shell Oil Company.

At the same time it was announced that R. M. Morrison of the Texas Company was reappointed national chairman of the oil company buyers' group of the National Association Purchasing Agents.

The national group with a membership of 220 including the New York group represents the principal oil company purchasing officials buying for domestic and foreign petroleum operations. One of the activities of the group is to initiate programs affecting purchasing for presentation to API, ASME, NAM and other associations.

C. J. Van Landeghem

Oceco Sales Manager

C. J. VAN LANDEGHEM former sales manager for Philip Carey Company is the new sales manager of the Oceco division of Johnston & Jennings Co.

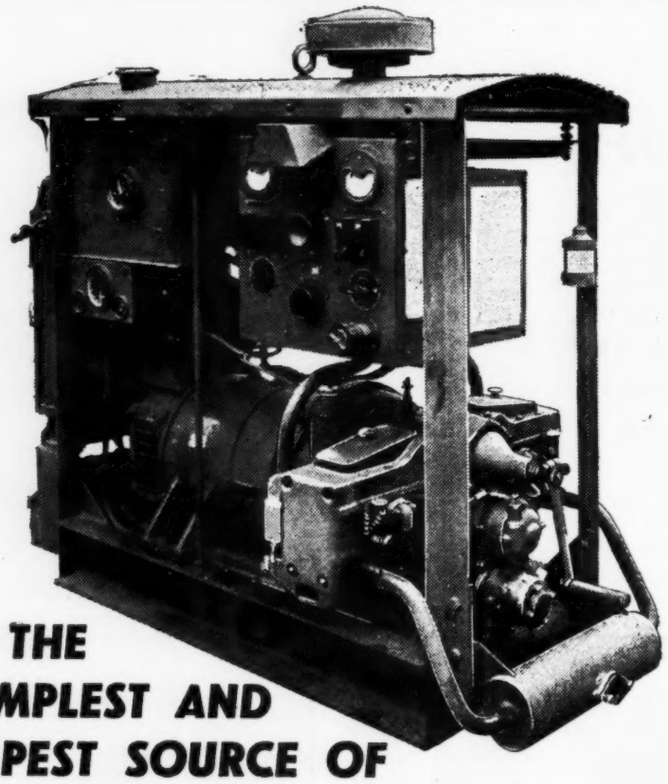
Continental Executives Move Up

F. M. Mayer

FREDERICK M. MAYER has been elected president of Continental Supply Co. to succeed William J. Morris who becomes chairman of the board. Frank I. Brinegar has been made executive vice president. Mr Morris has guided the growth of the company for many years and has been president since 1932. Mr. Mayer joined the company as treasurer in the same year and has been vice president during the past twelve years, since the company established its headquarters in Dallas. Frank Brinegar entered the employ of Continental in 1921, became assistant to the president in 1933 and vice president in 1935.

W. J. Morris

F. I. Brinegar



THE SIMPLEST AND CHEAPEST SOURCE OF 8-12 b.h.p. IS A

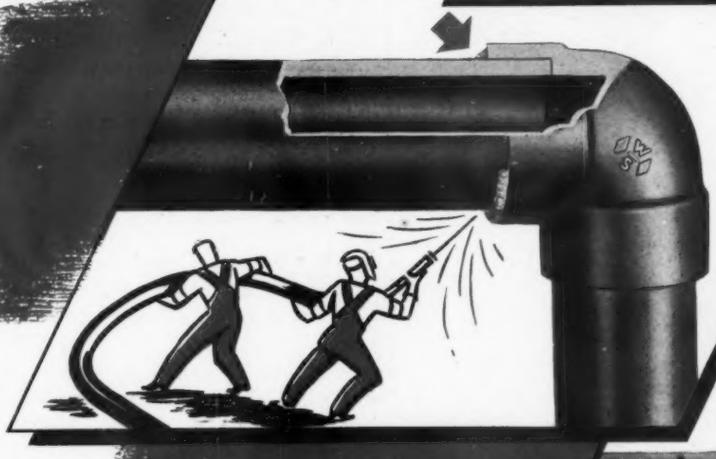
CUB DIESEL

The horizontal design of the "**CUB**" diesel gives inherent balance. It is a high-speed low-weight engine of 1006 c.c. capacity with a continuous heavy duty rating of 12 b.h.p. at 1,800 r.p.m. The "**CUB**" will start from cold, it will give good service for many years with practically no attention and uses very little fuel.

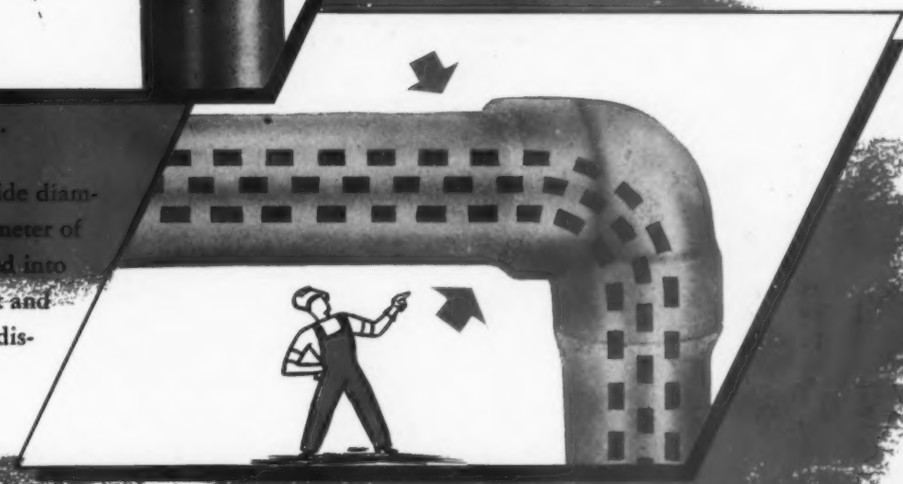
OIL ENGINES (COVENTRY) LTD.
Atlantic Works, Harefield Road, Coventry

How to make permanently tight leak-proof joints FAST

● Slip a compact, light-weight Watson-Stillman Socket Welding Fitting over end of pipe. Long bands, extending well beyond bottom of socket provide ample reinforcement, eliminating weak sections. Accurate measuring and cutting of pipe unnecessary.



● Make a clean outside-the-pipe fillet weld. Deep socket, supports and aligns the pipe, eliminating tack welding, and the use of special fixtures. Position of weld prevents welding icicles inside pipe — no clogged lines. Wall sections, 1¼ times the nominal pipe thickness permits proper heat penetration and correctly proportioned fillet weld.



● Smooth flow assured as inside diameter of fitting matches inside diameter of pipe. The fitting and pipe are fused into one integral unit, permanently tight and leak-proof. Unaffected by vibration, distortion and shock.

Watson-Stillman Socket Welding Fittings are available for use with Standard Pipe—Schedule 40; Extra Heavy Pipe—Schedule 80; Schedule 160 Pipe and Double Extra Heavy Pipe—Sizes ⅛" through 4" I. P. S.

Sold Through Leading Distributors

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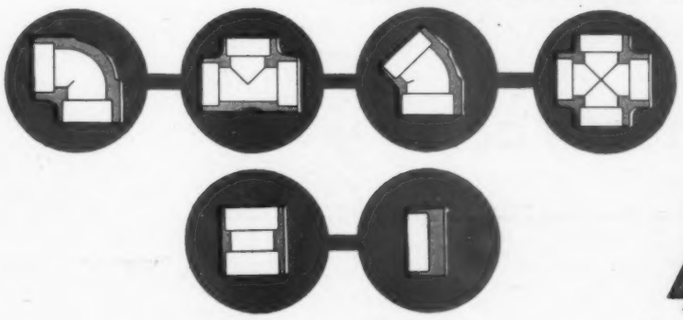

WATSON-STILLMAN

7354

Dresser Takes Security Engineering

SECURITY ENGINEERING CO., INC., Whittier, Calif., in the latest company to join the group controlled by Dresser Industries. The basis of the transaction is an exchange of one share of Dresser common stock for 1¾ shares of Security common stock. Approximately 35,000 shares of Dresser stock will be given in the exchange. Formal acquisition will be about October 1, 1945. Outstanding Security preferred stock has been called for redemption.

A manufacturer of oil field tools and specialties, Security Engineering Company, Inc., is the sole manufacturer of Securaloy, a patented metal for oilwell liners. It is also, through the purchase in 1944 of Crum-Brainard, Ltd, of California, the manufacturer of rock roller bits particularly adapted to drilling operations in difficult sub-strata. Acquisition of the company will further round out the activities of the thirteen Dresser member companies.

During 1945

Call **STEVENS 4-3072 Tulsa**

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GASKET NEEDS

STEVENS Ring Type Cylinder Head Gaskets. Guaranteed not to blow-out or burn-out under pressure. The best cylinder head gasket made for any gas engine your money can buy—not a critical material.

Gaskets of Copper, Aluminum or other metals.

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Stevens Precision-Built Gaskets go into vital installations wherever oil is produced. They are the vital seal for maximum performance. This is the only plant manufacturing metal-asbestos filled gaskets West of the Mississippi — closest to the source of supply for every Western need.

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GASKET MANUFACTURERS INSULATING MATERIALS AND CONTRACTORS

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G. S. Crane

Crane Heads Cutler-Hammer

G. S. CRANE has been made president of Cutler-Hammer, pioneer manufacturers of electrical specialties. He succeeds F. R. Bacon, founder of the company who has been president during most its nearly forty years of operation.

Iraq Pipeline Enlargement

IT is announced from London that construction of a second pipeline by the Iraq Petroleum Company will begin about the end of the current year. The line will extend from Kirkuk to Haifa on the eastern shore of the Mediterranean and will follow the route of one leg of the present bifurcated line connecting the Iraq field with tidewater. The new line however will be of 16-in. diameter as compared with the 12-in. line now in operation. It will be 6.20 miles in length and will carry 80,000 bbl. daily, more than doubling the capacity of this section of the present line.

Plans for the duplication of the famous desert line completed ten years ago were prepared in 1939 but construction was prevented by the outbreak of war in Europe. Since then these plants have been revised to provide increased capacity which will permit the stepping up of production from the Kirkuk field. It is expected that the enlarged line will be completed in 1948.

STINSON L. TAYLOR has been appointed special representative of the northeastern division, American Petroleum Industries Committee, it is announced by Baird H. Markham, the Committee's director. Mr. Taylor's territory will include Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York. He has been secretary of the New Hampshire Petroleum Industries Committee for the past twelve years and will still occupy that position in addition to his new assignment. He will continue to maintain headquarters in Concord, N. H.

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